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AN UPPER ORDOVICIAN CORAL FAUNA LOWER MACKENZIE RIVER AREA, N.W.T.

ROBERT L. BORDEN

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ABSTRACT

An upper Ordovician coral fauna is described, for the first time, from the Lower Mackenzie River area. It consists of twenty-seven different species, twenty-six of which are described and figured.

Correlations with other faunas, particularly in Manitoba are given.

A summary of the "Silurian" faunas previously reported from various localities in the area is given, along with the Ordovician faunules found at the mentioned localities.

The genus *Manipora* and *Catenipora* are described at some length. It is concluded that they are both valid and useful genera.

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AN UPPER ORDOVICIAN CORAL FAUNA FROM THE LOWER MACKENZIE RIVER AREA NORTHWEST TERRITORIES

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INTRODUCTION

During the summers of 1953 and 1954 the writer was employed by Peel Plateau Exploration Limited in a reconnaissance geological survey of the Northern Yukon and Northwest Territories. During the final summer, 1954, palaeontological collections from the Ronning included a coral faunule unknown to the author. In 1955 Peel Plateau gave permission to the writer to study this faunule. In order to make a more comprehensive study, the Peel Plateau collection was supplemented by collections from California Standard Company and Shell Oil Company.

Local stratigraphy is not discussed at the request of the companies which made the material available. The thesis is therefore confined to a discussion of the geological age of the collections and correlations with other regions. Formal descriptions of the important coral species are included.

HISTORY

In 1789 Alexander Mackenzie made the first exploration of what is now known as the Mackenzie River. He established a flourishing fur trade that 167 years later is still one of the major industries of the area. Mackenzie was followed by many famous explorers such as Sir John Franklin, Dr. John Richardson, William Ogilvie, Joseph Keele and Charles Camsell.

In 1920 oil was discovered at Norman Wells. The discovery stimulated geological explorations of the surrounding area by Hume, Williams, Whittaker, and Cameron. After the initial flurry,

however, interest died.

The second period of geological exploration was in the 1940's. World War II made oil at Norman Wells of strategic importance. In an effort to extend known oil reserves, the Canadian and American governments conducted a joint exploration of the area under the now famous Canol agreement. The Canol agreement terminated March 8, 1945.

Renewal of interest in the area followed the discovery of the Leduc oil field in 1947. Large exploration concessions were taken out by a number of companies. Collections made by some of these companies are used in this thesis.

GEOGRAPHY AND PHYSIOGRAPHY

The area under consideration encompasses the Canyon Ranges of the Mackenzie Mountains, the Franklin Mountains, and adjacent areas (figs. 1, 2).

The name Canyon Ranges was given by Bostock (1948) "by reason of the numerous canyons cut by the major streams in the older floors of their valleys as they traverse and leave these ranges". The Canyon Ranges approximately parallel the Mackenzie River to Normal Wells, and then in a great arc turn and strike westward (fig. 2). Relief of the Canyon Ranges is from 1,000 to 4,000 feet.

East of the Mackenzie River the Franklin Mountains extend from Nahanni Butte northward almost to Fort Good Hope. They form the "easternmost zone of mountain structures bordering the Interior Plains". Relief on this range is from 1,000 to 3,000 feet.

The major river in the area is the Mackenzie River. It

CAPE CALHOUN
RICHARDSON MTS
Thesis area
OGHVIE MTS
MACKENZIE MTS
BOOTHIA PEN.
SILLIMANS
FOSSIL MOUNT
GREAT SLAVE LAKE
K-43
HUDSON BAY LOWLANDS
EDMONTON
ROCKY MOUNTAINS
BEAVERFOOT
SOUTHERN MANITOBA
TIMISKAMING
LAKE THUROR
ANTICOSTI ISLAND
MOUNTAIN FRONT
MOUNTAINS
INDEX MAP
Fig 1

flows northward for 2,514 miles from Great Slave Lake to the Arctic Ocean. The Mackenzie River drainage basin includes all the rivers of the Franklin and Mackenzie Mountain systems.

The Mackenzie River is the life line to the north. All the major settlements of the area are either beside, or accessible to the Mackenzie River. The major transportation medium that serves the area is river barge and boat. In the last few years the Mackenzie River "life line" has been supplemented by air travel. However, even this travel owes its existence to the availability of fuel and supplies brought in on the Mackenzie River.

To the natives of the area and many of the immigrants, the Mackenzie is an important source of food; while the great flats along the Mackenzie form the locale of the major industry - fur trading.

PREVIOUS WORK

The first Ordovician to be reported from the Mackenzie Mountains was by Keele (1910) from a locality on the Keele River (Gravel River) in the Tigonankweine Range. The next reported Ordovician from the Mackenzie basin was in the vicinity of Great Slave Lake by Hume (1926) and Lord (1942).

Ordovician graptolite beds have been reported from the Richardson Mountains, portions of the Ogilvie Mountains, and the interior of the Mackenzie Mountains. This is beyond the scope of the thesis.

THE FAUNA

The Ramparts River (Pe-6) Faunule

The largest and most varied collection is from the top of an unnamed mountain on the Ramparts River, six miles south of the Mackenzie Mountain front (fig. 2). It consists of about fifty-five specimens which have been classified into twenty-one species, representing nine genera and three phyla. The large number of species from such a small collection was the result of limited facilities for carrying material. The collections are therefore selective rather than representative; the largest proportion of the faunule consisting of Halysitidae and Favositidae. The faunule is listed below.

Palaeophyllum halysitoides (Wilson)

P. parvum Stearn

P. stokesi (Edwards and Haime)

P. vaurealensis (Twenhofel)

P. 31065 nov. n.

Calapoecia anticostiensis Billings

Sarcinula 31029 nov. sp.

Paleofavosites capax (Billings)

P. okulitchi Stearn

P. prolificus (Billings)

Catenipora agglomeratiformis (Whitfield)

C. quebecensis (Lambe)

C. rubra Sinclair and Bolton

Manipora 31033 nov. sp.

M. 31033 var *A* nov. var.

M. amicarum Sinclair

Streptelasma angulatum (Billings)

Streptelasma trilobatum (Whiteaves)

Streptelasma sp.

Rhynchotrema cf. R. capax (Conrad)

Kochoceras sp. (identified by Dr. S. J. Nelson)

Streptelasma:

The Ramparts faunule contains Streptelasma angulatum, S. trilobatum, and Streptelasma sp.

The primary types of S. angulatum are from the English Head and Vaureal formations of Anticosti Island. It is present in the Richmond of Lake Timiskaming, the Stony Mountain formation of southern Manitoba, and the Stony Mountain equivalents of the Hudson Bay lowlands.

S. trilobatum has been reported from the Stonewall and Stony Mountain formations, and questionably from the Red River formation of southern Manitoba. It is also present in Stony Mountain equivalents of Hudson Bay, the Beaverfoot of the Rocky Mountains, and the Cape Calhoun beds (as S. foerstei) of Greenland. Nelson (pers. comm.) considers this species diagnostic of upper Ordovician.

Although Streptelasma sp. is undescribed, the primary types will be from Stony Mountain equivalents of the Hudson Bay lowlands.

Palaeophyllum:

The Ramparts faunule has five species of Palaeophyllum. Palaeophyllum halysitoides was described from the Beaverfoot formation, and is also found in the Red River and Stony Mountain equivalents of the Hudson Bay lowlands.

Palaeophyllum parvum is present in the uppermost Ordovician of Manitoba - the Stonewall formation.

Palaeophyllum stokesi has a wide distribution in the upper Ordovician and has been reported from the Silurian.

Palaeophyllum vaurealensis was described from the Ellis Bay and Vaureal formations of Anticosti Island. Baillie (1952) reports a questionable form from the Red River of Manitoba.

Palaeophyllum 31065 was originally described by Raduguin from the upper Ordovician of Western Siberia. Nelson reports it from the Stony Mountain equivalents of the Hudson Bay lowlands.

Calapoecia:

Cox (1936) considered Calapoecia to be characteristic, although not exclusive, of the upper Ordovician. Sinclair (1956) disagrees with this view because his work was "so muddled stratigraphically as to be of little use". We have in our collections C. canadensis and C. anticostiensis. Although C. canadensis ranges from the Black River to Richmond, the easily recognizable C. anticostiensis has only been reported from the upper Ordovician beds of North America. The Ramparts River faunule contains only C. anticostiensis.

Paleofavosites:

The Ramparts River faunule has three species of Paleofavosites - P. prolificus, P. okulitchi, and P. capax.

P. prolificus occurs in both upper Ordovician and Silurian, and is therefore of little stratigraphic value.

P. okulitchi and P. capax are present in the Stony

Mountain and Red River formations, but are confined to the Stony Mountain equivalents in the Hudson Bay lowlands.

P. capax occurs in the Ellis Bay, Vaureal and English Bay formations of Anticosti Island, and the Richmond of Lake Huron.

Catenipora:

Buehler (1955) has shown that almost all the American species of Catenipora are confined to the Ordovician. Teichert (1937) describes two Catenipora from the Silurian. He was correlating his fauna, at least in part, with the Mount Kindle formation. As we shall see, the age of these beds is in question.

The Ramparts River faunule has three species of Catenipora - C. agglomeratiformis, C. quebecensis and C. rubra. Although they are not diagnostic of upper Ordovician, they are nevertheless confined to the Ordovician.

Manipora:

Manipora amicarum, the only previously described species of this genus, occurs in the Red River formation. It is also present in the Red River equivalents of the Hudson Bay lowlands.

Ted Creek (Cr-11-27) Faunule

This suite was collected from Ted Creek, a tributary of the Arctic Red River, near the Mackenzie Mountain front. The following species are common to the Ted Creek and Ramparts River faunules:

Calapoecia anticostiensis

Paleofavosites prolificus

Catenipora agglomeratiformis

C. rubra

Manipora amicarum

In addition to the above the following species were collected, but are not common to the Ramparts River faunule:

Calapoecia canadensis

Catenipora rubra var. 31525 nov. var.

Manipora 31545 nov. sp.

Although Calopoecia canadensis is a long range species, it is a good index fossil of the Ordovician.

Gibson Range (K-107) Faunule

The suite collected from Gibson Range in the Franklin Mountains has six species, all common to the Ramparts River suite:

Palaeophyllum halysitoides

Palaeophyllum cf. P. vaurealensis

P. 31065

Paleofavosites capax

Manipora 31033 var. A nov. var.

Streptelasma sp.

Collections from the location include small suites that are probably from different horizons (see Table I). They include the following species:

Catenipora agglomeratiformis

Streptelasma angulatum

Palæophyllum parvum

P. prolificus

Paleofavosites sp.

One previously undescribed species, Manipora 34072, from the above suites is apparently confined to this locality. Two species, Paleofavosites sp. and Foerstephyllum sp., have not been identified, and thus are of no stratigraphic value. The remainder of the suites have species that are common to the Ramparts River faunule.

Other Suites

A number of suites have such a small number of species that they are of questionable stratigraphic value. They are listed in the Appendix and in Table II. Species from these suites are apparently common to the faunules listed above, and are probably the same age.

Two species, Palæophyllum calicina and Holophragma anticonvexa, are new to this area. They are both upper Ordovician species; the former from Anticosti Island and southern Ontario, and the latter from the Stony Mountain formation of Manitoba.

Summary

Twenty-eight species are represented in the above collection. Twenty-one of these are present in the Ramparts River

Cranswick River (Cr-11-6) Faunule

This faunule was collected by the late S. J. Cranswick from a number of horizons on a mountain immediately east of a hitherto unnamed river, tributary to the Arctic Red River (fig. 2). For this tributary we are submitting the name "Cranswick River" to the Canadian Board of Geographic Names.

All records of this collection were lost in a drowning accident that took the life of S. J. Cranswick. We do know, however, that the specimens were collected from one mountain; we have therefore grouped them into one faunule. The following are species that are common to the Ramparts River faunule:

Palaeophyllum halysitoides

P. parvum

Catenipora rubra

Streptelasma trilobatum

Streptelasma sp.

Redstone River Faunule (BM-94-1B)

The largest faunule from the Redstone River is BM-94-1B. It has the following species:

Foerstephyllum sp.

Paleofavosites capax

Paleofavosites sp.

Manipora 34072 nov. sp.

Streptelasma sp.

faunule, eight in the Ted Creek, five in the Cranswick River, six in the Gibson Range, and six in the Redstone River faunule. All the faunules have the largest proportion of their species common to the Ramparts River faunule, and are therefore probably of the same age, although not necessarily of the same horizon. Diagnostic species such as Streptelasma angulatum, S. trilobatum, Calapoecia anticostiensis, Palaeophyllum vaurealensis, P. parvum, Paleofavosites capax and Rhynchotrema cf. R. capax indicate an upper Ordovician age that is most probably Richmondian and/or Gamachian.

CORRELATIONS

Hudson Bay Lowlands

Dr. S. J. Nelson (in press) has made a study of the Ordovician of the Hudson Bay lowlands in the area of the Nelson, Churchill, North Knife and South Knife Rivers. He was able to divide the Ordovician into two groups equivalent to the Stony Mountain and Red River formations of southern Manitoba. He reports the following coral fauna:

Red River Equivalents, Hudson Bay lowlands

Saffordophyllum sp.

Foerstephyllum vacuum

Favistella alveolata

Nyctopora (?) *foerstei*

Nyctopora sp.

Palaeophyllum stokesi

P. halysitoides

Calapoecia arctica (?)

Calapoecia anticostiensis

Streptelasma robustum

S. haysii

Plasmopora lambei

P. pattersoni

Catenipora rubra

C. robustus

C. agglomeratiformis

C. quebecensis

C. irregularis

C. fieldeni

Manipora amicarum

Manipora sp.

Stony Mountain Equivalents, Hudson Bay lowlands

Lyopora spp.(two species)

Foerstephyllum vacuum

Palaeophyllum 31065 nov. n.

P. stokesi

Favistella alveolata

Calapoecia anticostiensis

C. canadensis var. ungava

Streptelasma trilobatum

Streptelasma angulatum

Streptelasma angulatum var. nov.

Streptelasma solearis

Streptelasma patellum

Streptelasma sp.

Paleofavosites alveolaris ?

P. capax

P. prolificus

P. okulitchi

Favosites sp.

Protrochiscolithus kiaeri

Catenipora rubra

Catenipora irregularis

Catenipora robustus

Catenipora sp.

Manipora amicarum

Manipora sp.

An undescribed genus

Of the twenty-five coral species reported by Nelson from the Stony Mountain equivalents, eleven are found in the Ramparts River faunule. The Red River equivalents have twenty-one species, of which seven are present in the Ramparts River faunule.

Southern Manitoba

In southern Manitoba the Ordovician carbonates are divided into three formations - the Red River (lowest), Stony Mountain and Stonewall formations. The following corals have been identified from the section.

Stony Mountain Formation

Calapoecia canadensis ungava

C. anticostiensis

C. huronensis

Paleofavosites okulitchi

Holophragma anticonvexa

Paleofavosites capax

P. prolificus

P. aspera

Protaraea vetusta

P. richmondensis

Streptelasma rusticum

S. trilobatum

S. latusculum

Favistella alveolata

Palaeophyllum stokesi

Tetradium ontaria

Of the above sixteen species, seven are present from our area, and six from the Ramparts River faunule.

Red River Formation

Calapoecia canadensis

C. canadensis var. *ungava*

Favistella alveolata

Favistella sp.

Manipora amicarum

Catenipora rubra

Paleofavosites prolificus

Palaeophyllum stokesi

Plasmopora sp.

Protarea magna

P. vetusta

Streptelasma robustum

S. trilobatum

Tetradium fibratum

Palaeophyllum calicina

Catenipora quebecensis

Stonewall Formation

Paleofavosites capax

P. prolificus

P. poulseni

P. okulitchi

Angopora manitobensis

Calapoecia canadensis

Halysites sp.

Lyellia sp.

Palaeophyllum pasense

P. parvum

Tryplasma gracilis

Neozaphrentis hindi

Streptelasma cf. *integriseptatum*

Comparison of the above faunas with the Ramparts River faunule shows that three of the thirteen species of the Stonewall formation, six of the sixteen species of the Stony Mountain formation, and five of the fourteen Red River species are common to the two areas.

Mackenzie Mountains (Previous Work)

Ordovician was reported from the Mackenzie Mountains by Keele (1910) from a locality on the Keele River (Gravel River) in the Tigonankweine Range (fig. 2). The fauna consisted of:

Favosites aspera ?

Calapoecia canadensis

Halysites catenularia var. *gracilis*

Columnaria rugosa

Actinoceras Bigsbyi

This suite is very similar to our Ted Creek faunule.

Great Slave Lake

Hume (1926) and Lord (1942) report Ordovician from the

vicinity of Great Slave Lake. A composite list of the coral fauna is as follows:

Streptelasma cf. *prolongatum*

Streptelasma cf. *fragile*

Streptelasma spp.

Zaphrentis sp.

Halysites nr. *H. delicatulus*

Calapoecia canadensis

C. anticostiensis

Columnaria alveolata

C. halli

Syringopora sp.

Paleofavosites aspera

Paleofavosites cf. *capax*

Paleofavosites spp.

Labyrinthites ? sp.

Protrochiscolithus cf. *kiaeri*

In addition to the above, we have one Ordovician collection (K-43), from this area which is as follows:

Streptelasma trilobatum

Sarcinula 31029 nov. sp.

Other Areas

Ordovician has been reported from a number of islands in the Arctic. Troedsson (1928) described a middle and upper Ordovician fauna from Northern Greenland. Teichert (1937) reports Ordovician and Silurian (?) from Boothia Peninsula and King William Island. Numerous other localities of the Arctic islands have been summarized by Miller,

Youngquist, Collinson, et al (1954).

In Alaska a number of collections of Ordovician were reported in the early 1900's by Kindle (1908, 1911), Prindle (1913) and Cairnes (1914). The suites are too small to be of any use, other than to state they are of Ordovician age.

From the foregoing it can be seen that our fauna correlates well with the Ordovician. We have five species that we cannot identify, or are new species, and twenty-two species previously described from Ordovician beds. Our most direct correlation is with the Hudson Bay lowlands where fifteen of our species are represented, to southern Manitoba where eleven of our species are represented, and to Anticosti Island where five and possibly eight of our species are represented.

Exact correlation is not as clear. Our fauna contains elements of both the Stony Mountain and Red River.

Some workers regard the Red River as Trenton in age. This would therefore give us both Trenton and Richmond strata from the same beds.

We do not hold to this view however and consider the Red River is Richmond. In support of this is the similarity of our fauna to known Richmond and Gamachian (Post Climacograptus) beds of Anticosti Island. We have such diagnostic forms as Palaeophyllum vaurealensis, Calapoecia anticostiensis, and Streptelasma angulatum that are also present in Anticosti Island Ordovician.

The close relationship of Red River and Stony Mountain has been pointed out by Miller, et al (1954), Nelson (pers. comm.) and others. The occurrence of Manipora and Catenipora species that are

referable to Red River species, along with the typical Stony Mountain forms of Streptelasma and Palaeophyllum strengthen this view. We are of the opinion, therefore, that our fauna is upper Ordovician in age, most probably of a late Richmond and early Gamachian.

The area from which we are reporting the upper Ordovician fauna has previously been considered as having lower Palaeozoic rocks of only Cambrian and Silurian ages. We must therefore give consideration to the reported Silurian of the area.

After the discovery of oil at Norman Wells, the Geological Survey of Canada, conducted geological investigations of the surrounding areas.

Williams (1921) proposed the name, Mount Kindle formation for five hundred feet of grey, magnesium limestone. From this formation on Mount Kindle he reported the following fauna:

Columnaria alveolata (later reassigned to Acervularia gracilis)

Diphyllum multicaule

Halysites catenularia microporus

and stratigraphically higher, from a boulder "not far out of place":

Zaphrentis stokesii

Conchidium sp.

In our collections from Mount Kindle we have the following:

Palaeophyllum halysitoides

Catenipora quebecensis

Manipora 31033 var. A

Camsell and Malcolm (1921) report a fauna that "leaves no doubt of the Silurian age" from Mount St. Charles:

Halysites catenulatus

Chonchidium sp.

In our collections from Mount St. Charles we have:

Catenipora agglomeratiformis

C. rubra

Palaeophyllum calicina

P. parvum

Manipora 31033 var. A

Williams (1922) reported a fauna from the second mountain south of Mount Kindle with the following coral species:

Paleofavosites aspera

Zaphrentis sp.

Favosites sp.

Halysites catenularia var. microporus

and from Mount St. Charles:

Acervularia gracilis

Diphyllum multicaule

Paleofavosites aspera

Halysites catenularia microporus

Halysites compacta

Plasmopora follis

The workers of the Canol Project report (Hume, 1954) Silurian beds (Ronning formation) from the following areas, from which we have the undermentioned collections:

Mountain River	Catenipora rubra
Hume River	Sarcinula 31029
	Palaeophyllum stokesi

	Manipora cf. *M. amicarum*
	Catenipora agglomeratiformis
Imperial River Canyon	*Palaeophyllum vaurealensis*
	Catenipora quebecensis
	C. rubra

At Great Bear River (Mount St. Charles), Laudon (Hume, 1954) reports Silurian. Our collections have been previously listed.

As can be seen from the above, we report Ordovician from the localities that hitherto had been considered Silurian. On Read and Sutton Islands, geologists had a similar problem that may be considered analogus to our own. O'Neill (1924) stated "that a few fossils collected on Sutton Island had been referred to *Favosites*, *Halysites*, and *Streptelasma* by the late E. M. Kindle, and it was concluded that all the containing beds were of Silurian age and referable to ... middle Silurian Niagaran age". Miller and Youngquist (1947) state that these beds are almost certainly of Ordovician, and possibly Silurian age.

Kindle laid the foundations of the age of the beds in the Mackenzie basin. He was undoubtedly misled by the apparent association of *Conchidium* sp. with vague coral forms, and Halysitidae. We have found *Conchidium* sp. very close to our collections. Unfortunately, it was usually from scree and its exact stratigraphic position unknown. Additional information on the speciation of Halysitidae has shown that rather than being confined to the Silurian as Kindle believed, it was also present in the Ordovician being represented as the genera *Manipora* and *Catenipora*. Many of the *Halysites* spp. that he reported are probably assignable to the above genera.

The workers that followed Kindle were probably influenced by his work. Since collecting faunal material is so difficult in this area, no new evidence was found by these men and consequently they adopted Kindle's views.

Due to our larger collections, we are able to indicate that upper Ordovician is also present in this area. Extensive work and more careful collecting will have to be done before the exact stratigraphy can be determined. It should be clear, however, that the Ronning group and the Mount Kindle formation contain not just a Silurian, but also an Ordovician fauna. It follows from this that many of the sections reported by previous workers are not equivalent but cumulative.

SUMMARY AND CONCLUSIONS

A coral fauna that consists of five main genera, *Palaeophyllum*, *Paleofavosites*, *Catenipora*, *Manipora* and *Streptelasma* has been described from the Mackenzie and Franklin Mountains. It is shown to be correlative with the upper Ordovician of Manitoba.

Part of this fauna came from beds that had been considered Silurian. Previous workers did not realize that there were at least two Ordovician Halysitoid genera, *Manipora* and *Catenipora*; consequently their material was assigned to the Silurian genus *Halysites*.

Associated with the coral fauna were a few poorly preserved brachiopods and cephalopods. This is in contrast to the abundant cephalopod fauna found in other areas of the Arctic.

TABLE I

DISTRIBUTION OF UPPER ORDOVICIAN CORALS IN THE LOWER MACKENZIE RIVER AREA

	BM-83	BM-82	S-15B	S-15A	K-21	K-37	S-22C	WM-103	K-36	K-107	S-44T	S-44B	WM-104	BM-94 1A	BM-94 1B	BM-94 1C	BM-94 2	BM-94 1	BM-89	K-78B	K-98	BM-99	BM-103	BM-109	MF-2	Cr-11-6	Cr-11-27	Pe-6
Foerstephyllum sp.																				x								
Holophragma anticonvexa																				x								
Kochoceras																												x
Rhynchotrema cf. R. capax													x		x			x										x
Streptelasma sp.										x					x											x		x
S. trilobatum				x																						x		x
S. angulatum																	x											x
Manipora 34072															x													
M. 31545																											x	
M. 31033 var. A									x																			x
M. 31033	x																											x
M. amicarum																								x			x	x
Catenipora rubra var. 31525																											x	
C. rubra			x					x													x		x			x	x	x
C. quebecensis	x	x																			x							x
C. agglomeratiformis							x											x	x						x		x	x
Paleofavosites sp.														x	x													
P. prolificus														x													x	x
P. okulitchi																												x
P. capax										x					x						x							x
Sarcinula 31029			x																					x				x
Calapoecia canadensis																											x	
C. anticostiensis																									x		x	x
Palaeophyllum 31065										x																		x
P. vaurealensis										x	x											x						x
P. stokesi																								x				x
P. parvum			x			x			x							x										x		x
P. halysitoides		x		x						x																x		x
P. calicina					x				x																			

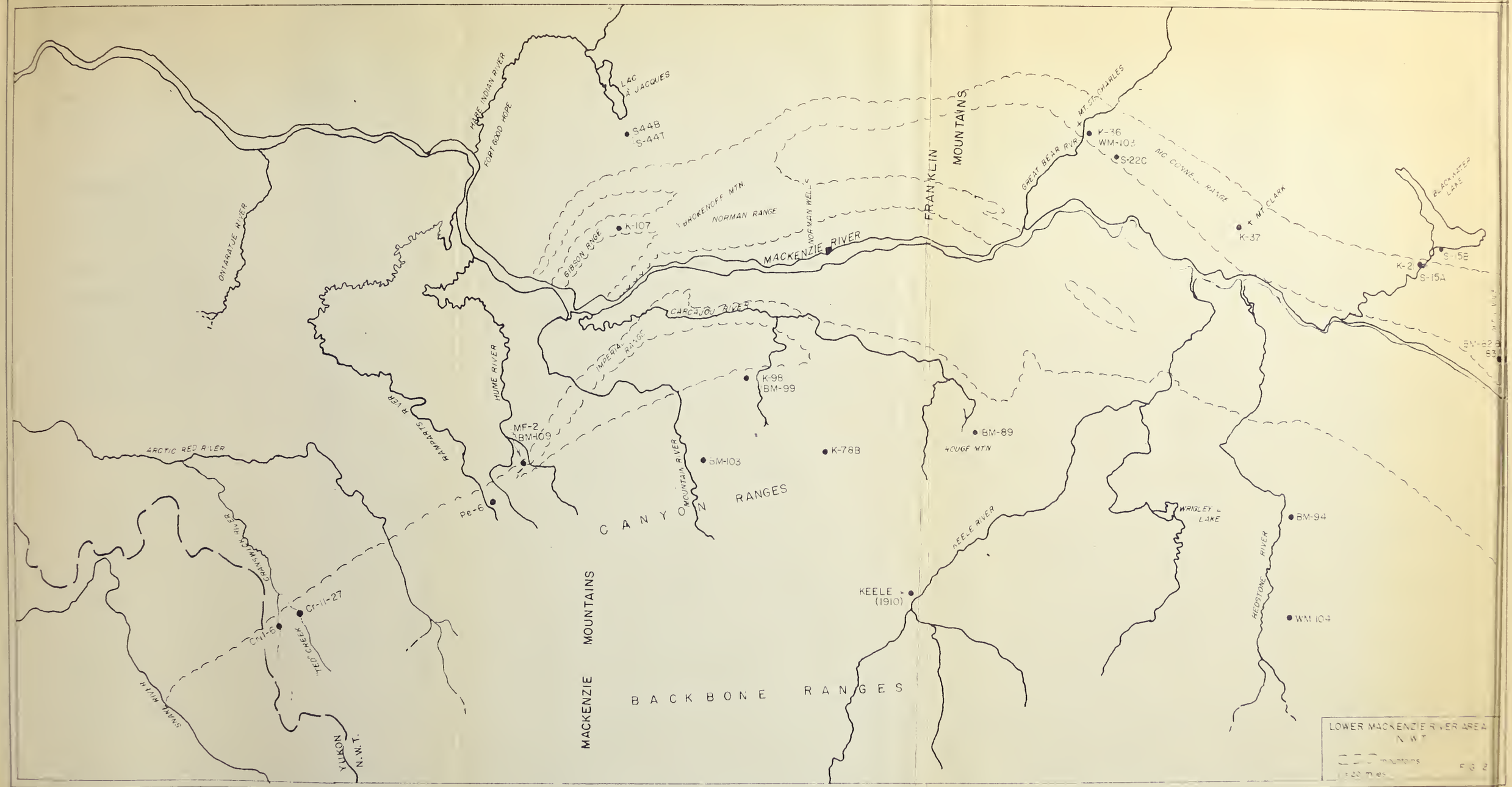
TABLE II

DISTRIBUTION OF UPPER ORDOVICIAN CORALS IN NORTH AMERICA

	Stony Mtn. Equivalent	Red River Equivalent	Stonewall	Stony Mtn.	Red River	Ellis Bay	Vaureal	English Head	Sillimans Fossil Mt. Greenland	Beaverfoot	Keele 1910	Hume & Lord & K-43	Alaska	Silurian	U. Ord.	M. Ord.
	Hudson Bay			Lake Winnipeg												
Foerstephyllum sp.															/	
Halysites gracilis				x						x					x	
Holophragma anticonvexa	x														x	
Streptelasma sp.	x			x	x							x			x	
S. trilobatum	x					x	x		x	x					x	
S. angulatum																
Manipora 34072								o								
M. 31545							o									
M. 31033 var. A																
M. 31033															x	
M. amicarum	x	x			x											
Catenipora rubra var. 31525	x	x			x					o	x				x	
C. rubra		x								o					x	x
C. quebecensis		x							x			o			x	
C. agglomeratiformis																
Paleofavosites sp.	x		x	x	x	x	x	x					o		x	
P. prolificus	x		x												x	
P. okulitchi	x		x	x		x	x	x				x			x	
P. capax	x											x			x	
Sarcinula 31029																
Calapoecia canadensis			x	x	x				x		x	x	x		x	x
C. anticostiensis	x	x		x		x	x	x	x	x					x	
Palaeophyllum 31065	x														x	
P. vaurealensis						x	x								x	
P. stokesi	x	x		x	x					x	x				x	
P. parvum			x												x	
P. halysitoides	x									x					x	
P. calicina					x										x	

o Occurrence uncertain

/ See Manipora amicarum and Catenipora rubra



LAC À JACQUES
HARE INDIAN RIVER
FORT GOOD HOPE
S-44B
S-44T
ONTARATUE RIVER
BROKENOFF MTN.
NORMAN RANGE
NORMAN WELLS
GIBSON RNGE
K-107
MACKENZIE RIVER
FRANKLIN MOUNTAINS
GREAT BEAR RVR
MT. ST. CHARLES
K-36
WM-103
S-22C
MC CONNELL RANGE
MT. CLARK
K-37
BLACKWATER LAKE
K-21
S-15B
S-15A
CARCAJOU RIVER
IMPERIAL RANGE
HUME RIVER
RAMPARTS RIVER
K-98
BM-99
MF-2
BM-109
ARCTIC RED RIVER
BM-103
K-78B
BM-89
ROUGE MTN
MOUNTAIN RIVER
CANYON RANGES
Pe-6
CRANSWICK RIVER
Cr-11-27
Cr-11-6
"TED" CREEK
SNAKE RIVER
YUKON
N.W.T.
MACKENZIE MOUNTAINS
BACKBONE RANGES
KEELE RIVER
KEELE (1910)
WRIGLEY L. LAKE
BM-94
REDSTONE RIVER
WM-104
LOWER MACKENZIE RIVER AREA
N.W.T.
mountains
FIG. 2

FOSSIL DESCRIPTIONS

The following section includes descriptions of twenty-five species, and two varieties of nine genera in two different phyla. Five are new species and one is nomen novum.

All the described species except *Paleofavosites prolificus* and *Paleofavosites* sp. are figured on the six plates at the back of the section.

The primary and secondary type specimens of the species, and varieties, are deposited in the University of Alberta Palaeontological Collection; the accession numbers are listed at the end of each formal description.

The classification we have used follows Shrock and Twenhofel (1953), unless otherwise noted.

PHYLUM COELENTERATA

Class ANTHOZOA

Subclass TETRACORALLIA (RUGOSA)

Family COLUMNARIIDAE

Genus Foerstephyllum Bassler

1941 Foerstephyllum Bassler, Bull. Geol. Soc. Amer., Vol. 52, No. 12, p. 1961.

Genotype: Columnaria ? halli Nicholson, 1879.

Bassler (1950) states this genus is characterized by "numerous horizontal tabulae and short straight septa ... extending about one quarter or less the distance to centre of corallite and all the way on the surface of the tabulae."

Foerstephyllum ? sp.

(Plate V, figures 3a, 3b)

We are not able to give a complete description of this species as the representatives in our collections are poorly preserved fragments.

The corallites of this species, smaller than any Foerstephyllum known to the writer, are in the order of 1 mm. in diameter. They are polygonal, with pentagonal and hexagonal shapes being the most common. About 12 strong septa or septal spines extend for a short distance into the corallite; they are about 0.2 mm. thick. Walls of the corallites are robust with a thickness of about 0.3 mm.

This species is similar to F. alveolata stellaris

Wilson, but the corallites are much smaller.

The genus has a range from Blackriver to Richmond. Although we were not able to identify the species, it was found with an upper Ordovician fauna at Redstone River (BM-94-1B). This is consistent with its occurrence in other areas.

Hypotype: University of Alberta No. 34076

Locality: Redstone River (BM-94-1B)

Horizon: Upper Ordovician

Unfigured plesiotypes: 34071, 34075 (BM-94-1B); 34200 (K-78B)

Genus Palaeophyllum Billings

(Plate I)

1858 Palaeophyllum Billings, Geol. Surv. Can., Rept. of Prog. 1857, p. 168.

Genotype: Palaeophyllum rugosum Billings, 1858.

This genus is a compound fasciculate coral.

The corallites are thick walled. Where they closely adjoin they tend to have a polygonal shape, otherwise they are circular or oval. The septa are of two orders: primary - which extend well into the corallite, and secondary - which are very short and are more properly called septal spines. The tabulae are usually strong and complete.

Species are most easily differentiated by the number of septa and the size of the corallites.

Bassler (1950) believes this genus is a Favistella. Lang, Smith, and Thomas (1940), and Wang (1948, 1950), believe it is more closely related to Streptelasma (fide Stearn 1956).

Palaeophyllum calicina [1] (Nicholson)

(Plate I, figure 6)

1874 Favistella calicina Nicholson, Rep. Brit. Assoc., Trans. of sections, p. 89 (fide Lambe 1900).

1876 Columnaria Hertzeri Rominger, Geol. Surv. Mich., Foss. Corals, p.90 (fide Lambe 1900).

1900 Columnaria calicina (Nicholson). Lambe, Geol. Surv. Can., Cont. Can. Palaeo., Vol. IV, pt. II, p. 102, pl. VI, fig. 4.

1 Some authors spell - calycina or calcina.

1924 Columnaria calicina (Nicholson). Foerste, Mem. 138, Geol. Surv. Can., p. 68, pl. 4, figs. 3a, b.

1950 Favistella alveolata calicina (Nicholson). Bassler, Geol. Soc. Amer., Mem. 44, p. 272, pl. 19, fig. 4.

Corallites of this species are usually polygonal, with a diameter of about 4 mm. There are 14 primary septa which often reach the centre, but do not join. The tabulae, which are flat and strong, are separated by about 0.5 mm. The corallites are close together, but seldom become favositoid.

The species is easily distinguished by the mode of growth, the size of corallites, and the number of septa. P. pasense Stearn has nearly the same number of septa, but has a different mode of growth.

Reported from the Richmond of Kentucky, Alaska and Ontario, from the Red River formation of Manitoba, Hudson Bay and Anticosti Island, this species appears to be diagnostic of the Richmond.

Hypotype: University of Alberta No. 34214

Locality: Martin Lake (K-36)

Horizon: Upper Ordovician

Unfigured plesiotype: 34215 (K-21)

Palaeophyllum halysitoides (Wilson)

(Plate I, figures 3a, 3b)

1926 Diphyllum ? halysitoides Wilson, Geol. Surv. Can., Geol. Ser. 46, Bull. 44, p. 18, pl. 2, figs. 8, 9.

1928 Columnaria halysitoides Troedsson, Medd. om Grønland, Vol. 72, pt. 1, p. 113, pl. 28, figs. 1 - 5.

1936 (non) Columnaria halysitoides Raduguin, Rec. Geol. West Siberian Reg., No. 35, p. 100, pl. 2, fig. 12 (teste Nelson).

The corallites of this species are 2 to 4 mm. in diameter, and have about 18 primary septa which project to the centre where there is a tendency for them to swirl. Due to the size of the fragments, the halysitoid tendency of the species is not readily apparent.

The tabulae are not well preserved. In a few places the tabulae bend upward, while in other corallites they bend downward or remain flat. Spacing is about 0.5 mm. apart.

This species has been reported from the Beaverfoot formation, and Nelson (pers. comm.) states it is present in Red River equivalents of the Hudson Bay lowlands.

Stearn (1956) states North American "Species of Palaeophyllum with a halysitoid growth are generally confined to the Richmondian stage."

Hypotype: University of Alberta No. 31050

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Unfigured plesiotypes: 34216 (K-107); 34217 ? (S-15A); 34111 (BM-82)

Palaeophyllum parvum Stearn

(Plate I, figure 5)

1956 *Palaeophyllum pasense parvum* Stearn, Geol. Surv. Can., Mem. 281, p. 90, pl. VII, fig. 5.

This species has small, hexagonal, diamond, triangular, and circular corallites. They are occasionally discrete, but are more commonly joined to adjacent corallites by thickening of the walls, forming a compact mass. The diameter of the corallites is in the order of 1 mm. and thus is the smallest *Palaeophyllum* described. When the corallites attain a size of 1.5 mm. they tend to be more circular and discrete. There are about 10 septa which project to the centre of the corallite. Tabulae are poorly preserved and are about 0.5 mm. apart.

Although our specimens are being referred to *P. parvum* Stearn, it should be noted that the mode of growth of the corallum of the smaller sized corallites is quite different. They are being referred to this species because of the number of septa and the similarity of the larger varieties of our species to ones described by Stearn.

This species was described from the Stonewall formation of Manitoba (Stearn 1956). In our area, it is associated with a typical Stony Mountain fauna at locality Pe-6, Ramparts River.

Hypotype: University of Alberta No. 31031

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Unfigured plesiotypes: 31034 (Pe-6); 34209 (K-36); 34212 (S-15B); 34211 (K-1B); 31066, 31067, 31073, 31074 (Cr-11-6); 34210 (K-37); 34046, 34047 (BM-94-1C)

Palaeophyllum stokesi (Edwards and Haime)

(Plate I, figure 2)

1851 Lithostrotion stokesi Edwards and Haime, Polyp. Foss. des Terr. Pal., p. 440, pl. 20, fig. 2.

1858 Palaeophyllum rugosum Billings, Geol. Surv. Can., Rept. of Prog. 1857, p. 168.

1897 Diphyllum stokesi (Edwards and Haime). Whiteaves, Geol. Surv. Can., Pal. Foss., Vol. 3, pt. 3, p. 152, pl. 17, figs. 5, 5a, b.

1899 Columnaria rugosa (Billings). Lambe, Ottawa Nat., Vol. 12, p. 217 (teste Nelson).

1900 Columnaria rugosa (Billings). Lambe, Geol. Surv. Can., Cont. Can. Palaeo., Vol. 4, pt. II, p. 101, pl. 6, figs. 3, 3a, b.

1926 Columnaria (Palaeophyllum) stokesi (Edwards and Haime). Hussey, Cont. Univ. Mich., Vol. 2, No. 8, pl. 11.

1928 (non) Columnaria (Palaeophyllum) stokesi (Edwards and Haime). Troedsson Medd. om Grønland, Vol. 72, No. 1, p. 111. pl. 27, figs. 1a - d.

The corallites are circular in shape with a diameter of about 5 mm. There are approximately 24 primary septa that reach to within 1 mm. of the centre. The secondary septa are short. The tabulae are more or less flat, and about 0.5 to 0.7 mm. apart. The distinctive feature of this species is that the corallites are almost always discrete and never form ranks.

Columnaria (Palaeophyllum) stokesi (Edwards and Haime) described by Troedsson (1928) is not a true P. stokesi because the septa are too numerous and unite in the centre of the corallites.

Palaeophyllum stokesi is common in the late Ordovician of North America (Table II). It was reported by Keele (1910) from the Keele River, and by Nelson (pers. comm.) from Stony Mountain equivalents in the Hudson Bay lowlands.

Hypotype: University of Alberta No. 31021.

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Unfigured plesiotype: 34159 (BM-109)

Palaeophyllum vaurealensis (Twenhofel)

(Plate I, figures 1a - 1d)

1928 Columnaria (?) (Palaeophyllum) vaurealensis Twenhofel, Geol. of Anticosti Island, Geol. Surv. Can., Mem. 154, p. 122, pl. IV, fig. 1.

This species is distinguished by the 12 to 14 primary septa which extend to the centre of the corallite where they often unite in simple fashion. The diameter of the circular corallites is 2.5 to 3 mm. As with all Palaeophyllum species, when the corallites come into contact they tend to become polygonal.

The tabulae, about 0.5 mm. apart, are bent downward in the centre of the corallite. Due to the difficulty in orienting the specimens, this is difficult to determine.

The species is distinguished from P. pasense Stearn by the smaller size of corallite, and the uniting of the septa at its centre.

To date, this species has only been described from the upper Ordovician of Anticosti Island.

Hypotype: University of Alberta No. 31076

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Unfigured plesiotypes: 34166 ? (BM-99-2); 34213 (S-44T); 31027 (Pe-6); 34219 ? (K-107)

Palaeophyllum 31065 nomen novum

(Plate I, figures 4a, 4b)

1936 Columnaria halysitoides [1] Raduguin, Rec. Geol. West Siberian Reg., No. 35, p. 100, pl. 2, fig. 12 (teste Nelson).

The halysitoid pattern of this species is very apparent even in small fragments of the species. The monoserial, short ranks are formed of mature corallites that average 3.5 to 4 mm. in diameter. There are 14 to 16 primary septa projecting into the centre of the corallite where they fuse into groups of two and three, and then form a nearly solid mass. Tabulae are flat and about 0.6 mm. apart.

The above description is almost identical to that of Columnaria halysitoides Raduguin furnished by Dr. S. J. Nelson. The name has been occupied by Wilson [1]. We are therefore designating the species as Palaeophyllum 31065, retaining the original holotype and diagnosis, and describing our specimens as hypotype and plesiotype.

Palaeophyllum 31065 has been reported from the upper Ordovician of Siberia. Nelson (pers. comm.) reports it from the Stony Mountain equivalents of the Hudson Bay lowlands.

Hypotype: University of Alberta No. 31065.

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Unfigured plesiotypes: 34218 (K-107)

1 See also Palaeophyllum halysitoides Wilson, p. 31

Subclass TABULATA

Family FAVOSITIDAE

Genus *Calapoecia* Billings

1865 *Calapoecia* Billings, Can. Nat. and Geol., New Ser., Vol. II, p. 426.

Genosyntypes: *Calapoecia anticostiensis* Billings, 1865

C. canadensis Billings, 1865

C. huronensis Billings, 1865

Cox (1936), who made an extensive study of this genus described its diagnostic features as: polygonal or circular corallites; well developed tabulae; walls composed of fused septal elements; 20 short septa that extend beyond the wall form "costae", which radiate into the coenenchyme.

The "costae" and septa are one and the same structure. It is here proposed to use the term SPEICHAE [1] for these structures.

In the intercorallite spaces, or coenenchyme, structures analogous to the tabulae within the corallite are herein termed TAVOLAE [2].

Calapoecia anticostiensis Billings

(Plate II, figures 1a - 1e)

1865 *Calapoecia anticostiensis* Billings, Can. Nat. and Geol., New Ser., Vol. II, p. 426.

1936 *Calapoecia canadensis* var. *anticostiensis* Billings. Cox, Nat. Mus. Can., Bull. 80, Geol. Ser. 53, p. 12; pl. 1, fig. 6; pl. 3, figs. 1a-c, 3d, 5a-c, 6, 7.

1 Speichae - from German speiche - spoke

2 Tavolae - from tavola - tabular surface.

1941 Calapoecia canadensis var. anticostiensis Billings. Roy, Field Mus. Nat. Hist., Geol. Mem., Vol. 2, p. 74, text figs. 38a-d.

1950 Calapoecia anticostiensis Billings. Bassler, Geol. Soc. Amer., Mem. 44, p. 276, pl. 20, figs. 9, 10.

Calapoecia anticostiensis is characterized by circular corallites that are separated by coenenchyme. The corallites are 1.5 mm. in diameter, with a coenenchyme that separates the corallites by about 1 mm. The colony is hemispherical, 9 cm. in diameter, and about 6 cm. high.

The speichae are from 1/2 to 3/4 mm. long; 1/3 projects into the corallite. The tavolae are about 0.2 mm. thick and 0.3 mm. apart. Intersections of the vertical speichae and the horizontal tavolae produce a three dimensional lattice-work. This lattice-work forms the wall for the corallites which are tubes in the structure.

The tabulae appear to extend across the corallite at the same level as the tavolae, but are much thinner and more undulatory. There are short septal spines at the intersections of the tavolae and the speichae.

This species is very similar to species of Plasmopora but does not have a vesicular coenenchyme.

C. anticostiensis has been described from a number of upper Ordovician horizons in North America, and appears to be diagnostic of these strata.

Hypotype: University of Alberta No. 31044

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Unfigured plesiotypes: 31537B (Cr-11-27); 33737 (MF-2)

Calapoecia canadensis Billings

(Plate II, figures 2a - 2c)

1865 *Calapoecia canadensis* Billings, Can. Nat. and Geol., New Ser., Vol. II, p. 426.

1936 *Calapoecia canadensis* Billings. Cox, Nat. Mus. Can., Bull. 80, Geol. Ser. 53, p. 12.

1950 *Calapoecia canadensis* Billings. Bassler, Geol. Soc. Amer., Mem. 44, p. 276.

The corallites of this species are about 4 mm. in diameter, and the coenenchyme between them is very narrow.

The tavolae are about 0.7 mm. apart and about 0.3 mm. thick.

The speichae are 1/3 mm. long, and frequently abut ones from adjacent corallites. Weak tabulae are known to be present, but due to weathering are not preserved. The corallite wall is similarly constructed to that of *C. anticostiensis*.

The genus has a long range in the Ordovician. It has been reported from Black River to uppermost Ordovician. Its distribution is wide, occurring in Canada, the United States, Greenland, the Arctic Islands, and Europe.

Hypotype: University of Alberta No. 31543A

Locality: Ted Creek (Cr-11-27)

Horizon: Upper Ordovician

Unfigured plesiotypes: 31567, 31543 (Cr-11-27)

Genus Sarcinula Lamarck, 1816

(Plate II, figures 3a - 3d)

Genosyntypes: Madrepora organum Linn., 1758

Sarcinula perforata Lamarck, 1816

This genus has thick walled, circular corallites. There are short septa or septal spines that extend into the coenenchyme. The corallite walls have horizontal rows of elongate pores. The tabulae are widely separated. The intercorallite spaces are occupied by coenenchyme that is not vertically continuous, but rather is developed as layers or "diaphragms".

Sarcinula 31029 sp. nov.

This species has thick walled circular corallites that are 1.5 to 2 mm. in diameter. The intercorallite spaces of 1 to 2 mm. are occupied by a coenenchyme. Twenty weak speichae occasionally extend into the corallites. The tabulae are strong and concave, separated by about 1 mm.

The coenenchyme is not vertically continuous but is developed as separate, frequently undulating, layers of vesicular material. The spacing of these layers is variable.

This species is quite similar to S. organum, but has 20 speichae instead of 24.

Sarcinula is generally considered as a Silurian genera. However, Troedsson (1928), Bassler (1950), and Hill (1951) report it from Ordovician beds. The number of septa of this species makes it the closest relative of Calapoecia yet described.

This species is associated with an upper Ordovician fauna from the Ramparts River. It was also found in probable Ordovician collections from the Hume River, Great Slave Lake area, and Black Water Lake.

Holotype: University of Alberta No. 31029

Unfigured topotype: 31057 (Pe-6)

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Figured paratypes: 34202 (K-14); 34154 (B-109-1A)

Unfigured plesiotypes: 34203 (S-15B); 34204 (K-43)

Genus *Paleofavosites* Twenhofel

1914 *Paleofavosites* Twenhofel, Can. Geol. Surv., Mus. Bull. 3, p. 24.

1928 *Paleofavosites* Twenhofel, Geol. Surv. Can., Mem. 154, p. 125.

1956 *Paleofavosites* Twenhofel. Stearn, Geol. Surv. Can., Mem. 281, p. 59.

Stearn (1956) has emended the genus *Paleofavosites* to include "Tabulate corals with all the characters of the genus *Favosites* except that most or all of the mural pores occur in the corners of the corallites. ... the favositids show an almost complete transition from *Paleofavosites* to *Favosites*."

Paleofavosites capax (Billings)

(Plate VI, figures 1a, 1b)

1866 *Favosites* ? *capax* Billings, Cat. Sil. Foss. Anticosti, p. 6.

1899 ? *Favosites aspera* d'Orbigny (partim). Lambe, Cont. Can. Palaeo., Geol. Surv. Can., Vol. IV, pt. 2, p. 6, pl. 1, fig. 2.

1914 *Paleofavosites capax* (Billings). Twenhofel, Can. Geol. Surv., Mus. Bull. 3, p. 24.

1928 *Paleofavosites capax* (Billings). Twenhofel, Geol. Surv. Can., Mem. 154, p. 125.

1956 *Paleofavosites capax* (Billings). Stearn, Geol. Surv. Can., Mem. 281, p. 61, pl. X, fig. 12.

The diagnosis of this species is confused. Twenhofel (supra cit.) assigns specimens with corallite diameters of 2 to 3 mm. to this species. Stearn (1956) believes the corallites have a median diameter of 3.79 mm., while other workers include specimens with corallites of up to 5 mm.

We are assigning to this species specimens that have mature corallites of 3 to 4 mm. in diameter. The mural pores are confined almost exclusively to the walls. Poor preservation, however, does not enable us to give the distribution throughout the length of the corallite. Tabulae are flat, strong, marginally deflected, 0.1 mm. thick, and about 0.7 mm. apart.

This species is distinguished from P. okulitchi because it has very few, or no, mural pores in the walls. It is distinguished from P. prolificus by the size of corallites.

P. capax has a wide distribution in the upper Ordovician of North America.

Hypotype: University of Alberta No. 31047

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Unfigured plesiotypes: 31002, 31028, 31041 (Pe-6); 34051 (BM-94-1B); 34200 (K-107); 34201 (K-98)

Paleofavosites okulitchi Stearn
(Plate VI, figures 2a - 2d)

1943 *Favosites intermedius* Okulitch, Trans. Roy. Soc. Can., Vol. XLIX: Ser. III, Sec. IV, p. 70, pl. 1, fig. 16.

1956 *Favosites okulitchi* Stearn, Geol. Surv. Can., Mem. 281, pp. 61, 62, pl. III, figs. 4, 6; pl. VIII, fig. 3.

This species has corallites that are unequal in size; the larger ones being 3.5 mm. in diameter, surrounded by immature corallites as small as 2 mm. Pores are abundant in both walls and corners. Septa are rudimentary to absent. The tabulae are plain, usually marginally deflected. The distance between tabulae varies from 0.5 mm. to 1 mm. The corallites are polygonal, with hexagonal shapes the most common.

P. okulitchi is probably not a true species as it was originally described as being intermediate in character between *Favosites* and *Paleofavosites*. It may therefore actually include an "aberrant" group of individuals resulting from the intermingling of various species of the two genera.

Hypotype: University of Alberta No. 31068

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Paleofavosites prolificus (Billings)

1865 Favosites prolificus Billings, Can. Nat. Geol., n.s., Vol. 2, p. 429 (fide Stearn).

1866 Favosites prolificus Billings, Cat. Sil. Foss. Anticosti, p. 6.

1895 Favosites prolificus Billings. Whiteaves, Pal. Foss., Vol. 3, pt. 2, p. 113.

1914 Paleofavosites prolificus (Billings). Twenhofel, Can. Geol. Surv., Mus. Bull. 3, p. 24.

1956 Paleofavosites prolificus (Billings). Stearn, Geol. Surv. Can., Mem. 281, p. 60, pl. IV, fig. 1; pl. X, fig. 13.

The corallites in this species range in size from 1.5 mm. to 2.5 mm. in diameter. Mural pores are present in the angles of the walls, but have not been observed in the walls. The tabulae are flat and 0.5 mm. apart. Stearn (1956) gives a good discussion of the relationships of P. prolificus to other species.

This species is common in the Stony Mountain formation, but also occurs in the Stonewall formation, and the Silurian Interlake group. On Anticosti Island it is reported from the Richmond, Gamachian, and Silurian. Nelson (pers. comm.) has found it in beds equivalent to the Stony Mountain formation in the Hudson Bay lowlands.

Unfigured hypotype: University of Alberta No. 31037

Location: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Unfigured plesiotypes: 34083, 34079 (BM-94-1A); 31055 ? (Cr-11-27)

Paleofavosites sp.

This species is characterized by its very large corallites and strong septal ridges. The corallites vary in size from 2.5 mm. to 8 mm. in diameter, with 6 mm. the most common. Mural pores, about 1 mm. apart, are present in the angles of the walls. The septal ridges are about 4 to a corallite wall.

The shape of the corallites is variable. Although hexagonal corallites are the most common, square and rectangular shaped ones are frequently observed, while a few 7 and 8 sided corallites are also present. The tabulae are not well preserved, but appear to be separated by 1 to 2 mm.

The writer was unable to make a thorough search of the literature; consequently it was not possible to assign our specimens to a species.

Repositories: University of Alberta Nos. 34050, 34084 (BM-94-1B)
Locality: Redstone River (BM-94-1B & 1A)
Horizon: Upper Ordovician

Family HALYSITIDAE

Genus Catenipora Lamarck

1816 Catenipora Lamarck, Histoire naturelle des Animaux sans Vertebres, p. 207 (fide Buehler, The Morphology and Taxonomy of the Halysitidae, Peabody Mus. of Nat. Hist., Bull. 8, p. 25, 1955).

1954 Catenipora Lamarck. Thomas and Smith, the Genus Halysites Fischer von Waldheim; Annals and Mag. Nat. Hist., Ser. 12, Vol. 7, No. 82, pp. 765-774.

1955 Catenipora Lamarck. Buehler, Peabody Mus. of Nat. Hist., Bull. 8, p. 25.

1955 Catenipora Lamarck. Sinclair, Some Ordovician Halysitoid Corals, Trans. Roy. Soc. Can., Vol. XLIX, Ser. III, Sec. IV, p. 99.

Buehler (1955) made a study of the species of the genus Halysites and concluded that two distinct genera were represented; one genera was characterized by dimorphic species, and the other by monomorphic species. Dimorphic species are those that contain mesocorallites, or tubules between the corallites, while monomorphic species do not.

The original genotype of Halysites was Tubipora catenularia; it was a dimorphic species. The second species of Halysitidae to be described was Catenipora escharoides; it was a monomorphic species. In later years taxonomists considered the two generic names as synonymous.

Buehler has resurrected the genus Catenipora for the monomorphic species, and retained Halysites restricting it to the

dimorphic species, although there is no reason to believe that either genus was to be considered in such a strict sense.

Sinclair (1955) divided Catenipora into three genera - Manipora, Quepora, and Catenipora emended. Catenipora emended includes species that have moniliform ranks and true septal structures. Those without septal structures and with moniliform ranks he placed in Quepora. Cateniporoids with multiple ranks and "inner walls wrinkled to form discontinuous longitudinal 'septa'" were assigned to Manipora.

In the writer's studies it was found that the genus Catenipora is best described as including those species that are monomorphic, have both a theca [1] and an epitheca,[1] are monoserial, and have characterisically rounded corallites, with or without septal structures.

The epithecal wall of Catenipora is continuous along the length of the ranks as is shown in Plate III, figures 1c, 1d, 2c. It appears to be of a different composition and thinner than the theca.

The theca forms the actual corallite and the common wall between corallites. Outgrowths of it may form septal spines. The rounding of the interior of the corallites is probably related to compositional differences between the theca and the epitheca.

The genus Quepora, which Sinclair erected to contain those species of Catenipora that do not have septal spines, does not appear valid. The writer was not able to obtain good enough specimens to determine the structure of the wall, but the corallite shape suggests that it has a double wall. It is monoserial, the same as the other cateniporoids. Absence of septa may be due to the size of the corallites and/or preservation. The writer believes that such a fine distinction as the presence or absence of septal spines does not justify a new genus and, therefore, rejects Quepora.

1 Equals peripheral stereozone and primary wall of Buehler (1955).

Catenipora agglomeratiformis (Whitfield)

(Plate IV, figures 1a, 1b)

1928 Halysites gracilis Hall. Hussey, Cont. Mus. Palaeo., Univ. of Mich., Vol. 3, No. 3, pt. 3, p. 71.

1928 Halysites agglomeratiformis Whitfield. Troedsson, Medd. om Grønland, Vol. 72, pt. 2, p. 133, pl. 46, figs. 1a-d.

1941 Halysites agglomeratiformis Whitfield. Roy, Field Mus. Nat. Hist., Geol. Mem., Vol. 2, pp. 77, 78, figs. 39a-c.

1954 Halysites agglomeratiformis Whitfield. Miller, Youngquist and Collinson, Geol. Soc. Amer., Mem. 62, p. 11, pl. 8, fig. 1.

1955 Catenipora agglomeratiformis (Whitfield). Buehler, Peabody Mus. Nat. Hist., Yale Univ., Bull. 8, p. 49.

The corallites are arranged in ranks that form vermiform lacunae about 3 to 8 mm. wide and 7 to 14 mm. long. The lacunae all tend toward the same general size, although the shape is variable.

The ranks between points of confluence consist of 4 to 6 corallites, although as few as 1 has been noted.

The corallites are $1\frac{1}{2}$ to 2 mm. long and 1 to $1\frac{1}{4}$ mm. wide. The corallites are moderately ovoid in shape. Some have rudimentary septa and it is assumed that they are present in all the corallites. Tabulation was not attempted on the position or number of the septa due to recrystallization.

The shape of the corallites of C. agglomeratiformis closely resembles C. rubra but they are not as large.

Hypotype: University of Alberta No. 33738

Locality: Hume River (MF-2)

Horizon: Upper Ordovician

Unfigured plesiotypes: 33733, 33735 (MF-2); 31548 (Cr-11-27); 34094 (BM-94-1); 31025 (Pe-6); 34109 (BM-89-2); 34147 (BM-89-1); 34221 (S-22C)

Catenipora quebecensis (Lambe)

(Plate III, figures 3a, 3b)

1899 Halysites catenularia var. Quebecensis Lambe, Geol. Surv. Can., Cont. Can. Palaeo., Vol. IV, pt. 1. p. 69, pl. 4, figs. 1, 1a, b.

1925 Halysites catenularia quebecensis (Lambe). Hume, Geol. Surv. Can., Mem. 145, pl. 5, figs. 3a, b.

1955 Catenipora quebecensis (Lambe). Buehler, Peabody Mus. Nat. Hist., Yale Univ., Bull. 8, p. 46, pl. 7, figs. 1-3.

1955 Quepora quebecensis (Lambe). Sinclair, Trans. Roy. Soc. Can., Ser. III, Sec. 4, Vol. XLIX, p. 96, pl. 1, figs. 3, 5, 8, 12.

This species is characterized by small corallites and small lacunae. The lacunae are varishaped, labyrinthic, and vermiform; from 1 to 4 mm. wide and up to 8 mm. long. The corallites are 3/4 mm. wide and 1 mm. long. No septa were observed. The corallites are oval and suggest that walls have a theca and an epitheca.

Sinclair (1955) has erected a new genus Quepora, with C. quebecensis as the genotype. We have rejected this interpretation (see page 48).

Buehler (1955) states "this is the oldest species of Halysitidae known." It is a long ranging species occurring from Black River to Richmond strata.

Hypotype: University of Alberta No. 31071

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Unfigured plesiotypes: 34117 (BM-82-3); 34105 (BM-83-1); 34222 (K-98)

Catenipora rubra Sinclair and Bolton

(Plate III, figures 1a - 1d)

1899 Halysites catenularia var. gracilis Hall (partim). Lambe, Geol. Surv. Can., Cont. Can. Palaeo., Vol. IV, pt. 1, p. 69, pl. 3, figs. 5, 5a, b.

1937 Halysites gracilis (Hall). Teichert, Rept. Fifth Thule Exped. 1921-24, p. 55, pl. 7, figs. 3, 6.

1941 Halysites cf. H. gracilis (Hall). Roy, Field Mus. Nat. Hist., Geol. Mem., Vol. 2, p. 79, text figs. 40a, b.

1944 Halysites gracilis (Hall, partim). Leith, Journ. Palaeo. Vol. 18, No. 3, pl. 43, figs. 5, 6.

1955 Catenipora gracilis Hall. Buehler, Peabody Mus. Nat. Hist., Yale Univ., Bull. 8, p. 36, pl. 4, fig. 7; pl. 5, fig. 1.

1955 Catenipora rubra Sinclair and Bolton. Sinclair, Trans. Roy. Soc. Can., Vol. XLIX: Ser. III, Sec. IV, p. 99, pl. 1, figs. 2, 6, 7, 11.

1956 Catenipora rubra Sinclair and Bolton, Journ. Palaeo., Vol. 30, No. 1, p. 204.

The lacunae in this species are labyrinthic, varying in size from 5 to 10 mm. in width, and from 10 to 20 mm. in length. The lacunae do not form any apparent pattern but the gently curving ranks are distinctive.

The tabulae in the corallites are fairly evenly distributed, about 0.6 to 0.7 mm. apart. They are approximately 0.1 mm. thick.

C. rubra is distinguished from C. agglomeratiformis by its larger corallites, gently curving ranks, and larger lacunae. C. quebecensis is much smaller in all dimensions.

C. rubra is a species newly described by Sinclair and

Bolton (1955) that was formerly assigned to *Halysites gracilis* Hall; however *H. gracilis* also included what is now known as *Manipora amicarum* Sinclair.

Hypotype: University of Alberta No. 31564

Locality: Ted Creek (Cr-11-27)

Horizon: Upper Ordovician

Unfigured plesiotypes: 31532 (Cr-11-27); 34223 (S-15B); 31523 (Cr-11-27); 31534 (Cr-11-27); 34224 (K-98); 34102 ? (WM-103); 31060 (Pe-6)

Catenipora rubra var. *31525* var. nov.

(Plate III, figure 2a - 2c)

The corallites are arranged in ranks that form elongate, and often parallel lacunae. The ranks anastomose every 4 to 6 corallites. When the ranks are parallel, a secondary pattern of "cross-ties" consisting of 1 or 2 corallites is formed.

The corallites are moderately ovoid from 1.5 to 2 mm. wide and 1 mm. long with the length generally $\frac{1}{2}$ mm. greater than the width. The corallite walls are 0.2 mm. thick and have a theca and an epitheca (Plate III, figure 2c). The tabulae are 0.5 to 0.6 mm. apart. No irregularities in the corallite wall were observed, but a few rudimentary septal structures were present.

C. rubra var. *31525* has corallites that are very similar but slightly larger than those of *C. rubra*. The pattern of elongate lacunae is distinctive but not continuous in the corallum. Where the pattern loses its elongate identity it becomes the same as that of *C. rubra*.

Holotype: University of Alberta No. 31525.

Topotype: 31522A

Locality: Ted Creek (Cr-11-27)

Horizon: Upper Ordovician

Genus *Manipora* Sinclair

1955 *Manipora* Sinclair, Trans. Roy. Soc. Can., Vol. XLIX: Ser. III, Sec. IV, p. 97, pl. 1, figs. 1, 4, 10.

Genotype: *Manipora amicarum* Sinclair, supra cit.

Sinclair (1955) states in describing the genus *Manipora* that it is "a Saffordophyllum-like coral of halysitoid habit, the subquadrate corallites forming single or multiple ranks, tabulae complete, the inner walls of the corallites sporadically wrinkled to form discontinuous longitudinal 'septa'."

In his studies the writer has found that *Manipora* is a valid genus. It is a separate entity from *Catenipora* and no intermixing of the two genus has been observed. *Manipora* frequently has multiple ranks; *Catenipora* never has. Where the ranks are multiple the walls of the corallites are frequently wrinkled. This does not occur in *Catenipora*.

The corallites of the two genus also differ in wall structure. *Catenipora* has a multiple wall composed of a theca and an epitheca. *Manipora* has a simple epithecal wall and no theca. The corallites of *Manipora* are made of intersecting epithecal walls and are characteristically angulate, similar to *Favosites*.

Corallites of this genus have two different shapes - the uncompressed or quadratic, and the compressed or polygonal. These shapes act as end members of a continuous series. The uncompressed corallite has slightly convex free walls, and a straight intercorallite wall. The compressed corallite, which occurs in multiple ranks, favositoid patches, and rank junctions, is polygonal

in shape with straight, though commonly wrinkled walls. In both types of corallites, the junctions of the walls are quite angulate.

In the past, Manipora has generally been assigned to Halysites gracilis. This was due to the quadratic shape of the uncompressed corallite.

Manipora amicarum Sinclair

(Plate IV, figures 2a - 2d; Plate V, figure 4)

1899 Halysites catenularia var. gracilis (Hall, partim). Lambe, Geol. Surv. Can., Cont. Can. Palaeo., Vol. IV, pt. II, p. 69, pl. III, fig. 6.

1928 (?) Halysites catenularia Linnaeus (partim). Twenhofel, Geol. Surv. Can., Mem. 154, p. 125.

1944 Halysites gracilis (Hall, partim). Leith, p. 268, pl. 42, pl. 43, figs. 2-4.

1955 Catenipora gracilis (Hall, partim). Buehler, Peabody Mus. Nat. Hist., Yale Univ., Bull. 8, pp. 36-38.

1955 Manipora amicarum Sinclair, Trans. Roy. Soc. Can., Vol. XLIX: Ser. III, Sec. IV, p. 97 seq., pl. 1, figs. 1, 4, 10.

The lacunae of this species are vermiform, up to 20 mm. long and 2 to 6 mm. wide. The ranks are both single and multiple, with "favositoid" patches common at the rank junctions.

The compressed corallites are polygonal in shape, and are about 1.5 mm. wide, while the uncompressed ones are 1.5 mm. wide and 2 mm. long. The walls of the former are commonly wrinkled into spine-like growths. The corallite walls, about 0.1 mm. thick, have an epitheca but no theca. The tabulae are 0.6 to 0.7 mm. apart, and 0.1 mm. thick.

Two specimens (31053, 34158) are questionably identified with this species. In these, the lacunae are less vermiform and more equidimensional. Favositoid patches and multiple ranks are rare.

M. amicarum is distinguished by the large size of its corallites and the robust nature of the corallum. It has been reported from the Red River formation in southern Manitoba, and the Stony Mountain and Red River equivalents of Hudson Bay lowlands.

It was formerly included in *Halysites gracilis*.

Hypotypes: University of Alberta Nos. 31560, 31546

Localities: Ramparts River (Pe-6)

Ted Creek (Cr-11-27)

Horizon: Upper Ordovician

Unfigured plesiotypes: 31054, 31049, 31053 ? (Pe-6); 31530 (Cr-11-27); 34158 ? (BM-109)

Manipora 31033 sp. nov.

(Plate V, figures 1a, 1b, 1f)

1947 Halysites spp. Miller and Youngquist, Journ. Palaeo., Vol. 21, No. 1, p. 5, pl. 1, fig. 3.

Within specimens referred to this species there are two distinct types of lacunae:

(1) Varishaped labyrinthic lacunae from 5 to 10 mm. long and 1 to 2 mm. wide.

(2) Circular lacunae that have a diameter of about 2 mm.

A rank may have from 1 to 7 corallites in its length and may be composed of either single or multiple rows of corallites.

The uncompressed corallites are 1.5 mm. long and 1.3 mm. wide, the greatest dimension parallel to the rank. The compressed corallites are about 1.5 mm. wide, and pentagonal or hexagonal in shape.

The corallite walls are simple, consisting of an epithecal layer 0.1 mm. thick. They are smooth in the uncompressed corallites but commonly wrinkled or spiny in the compressed. Junctions of the walls are angulate. The tabulae are flat, average 0.5 mm. apart, and are about half as thick as the walls.

This species is easily recognized by the distinct type of lacunae and the size of the corallites. There are similarities to Halysites irregularis Teichert (1937), but as the illustrations are poor the writer is unable to determine if circular lacunae are present.

The circular lacunae appear to rise from a favositoid patch where one central corallite dies, probably due to an inability

to obtain food. The circular lacunae is apparently maintained to provide good circulatory conditions. They start abruptly as mature lacunae.

One specimen of this species has been illustrated by Miller and Youngquist (1947 supra cit.) from Read or Sutton Island.

Holotype: University of Alberta No. 31033

Paratype: University of Alberta No. 31006

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Unfigured plesiotype: 34153 (BM-83)

Manipora 31033 var. A var. nov.

(Plate V, figures 1c - 1e)

1899 Halysites catenularia var. gracilis (Hall, partim). Lambe, Geol. Surv. Can., Cont. Can. Palaeo., Vol. IV, pt. I, pl. III, fig. 7.

This variety is very similar to Manipora 31033 except that it is smaller in its dimensions of lacunae and corallites. The lacunae are 1.4 mm. in diameter. The labyrinthic lacunae are 2 to 7 mm. long and about 1 mm. wide. The uncompressed corallites are 1 mm. long, and about 0.9 mm. wide. The compressed corallites are 1 mm. wide. The circular lacunae are not always as well developed as they are in M. 31033 and may be missing in smaller fragments (Plate V, figure 1d). This variety is included in M. 31033 because the general pattern of growth is so similar that it suggests a continuous interbreeding series is present between the two.

A complete colony from Brockenhoff Mountain in the University of British Columbia palaeontological collections is hemispherical in shape, 18 cm. in diameter, and 6 cm. high.

It is probable that some of the specimens collected from the Franklin Mountains by Williams (1921, 1922), and referred to Halysites catenularia microporous actually belong to this variety.

Holotype: University of Alberta No. 31015

Locality: Ramparts River (Pe-6)

Paratypes: 31010, 31014, 31056

Unfigured plesiotypes: 34227 (K-36); 34226 (K-107); 34153 (BM-83)

Manipora 31545 sp. nov.

(Plate IV, figures 3a - 3c)

1928 (?) *Halysites catenularia* Linnaeus (partim). Twenhofel, Geol. Surv. Can., Mem. 154, p. 125.

In this species the lacunae are both vermiform and labyrinthic; the most common size range being about 5 mm. wide and from 5 to 15 mm. long. The ranks are usually single, but favositoid patches were observed in one specimen.

The diagnostic feature of this species is the striking rectangular shape of the corallites, elongated across the rank as opposed to other species of *Manipora* where the elongation is parallel to the rank. The mature uncompressed corallite is 1.5 mm. long and 1.8 to 2 mm. wide. The compressed mature corallite is 1.5 mm. in diameter.

The walls consist of a simple, single epitheca, thus this unusual species is assigned to the genus *Manipora*. No septa or spinous growths have been observed in either the compressed or uncompressed corallites. The tabulae are 0.5 mm. to 0.6 mm. apart and 0.1 mm. thick.

This new species has not been reported from other localities of the Mackenzie basin, and thus has not been of any stratigraphic value.

Holotype: University of Alberta No. 31545

Topotypes: 31506, 31551

Locality: Ted Creek (Cr-11-27)

Horizon: Upper Ordovician

Manipora *34072* sp. nov.

(Plate V, figures 2a, 2b)

This species has distinctive lacunae that are more or less polygonal, ranging in size from 1 to 3 mm. across. The ranks enclosing the lacunae usually consist of only 1 or 2 corallites, adding to the distinctive features of the species. No favositoid patches were observed.

The corallites are usually hexagonal. They are 1.5 mm. in diameter and have no thecal walls. No septal spines were observed. The tabulae are about 0.5 mm. apart and about the same thickness as the walls.

This species is similar to *Halysites* cf. *fieldeni* Wilson (1931), *Halysites aequibalis* Teichert (1937), *Halysites spp.* (Miller and Youngquist 1947, pl. I, fig. 3); however, the writer is not able to determine the wall structures of the above species to determine their assignment.

This species is confined to one locality and has been of little stratigraphic use.

Holotype: University of Alberta No. 34072

Topotypes: 34034, 34062, 34067

Locality: Redstone River (BM-94-1B)

Horizon: Upper Ordovician

Family STREPTELASMIDAE

This family was interpreted by Stumm as including tetracoral species that are solitary, have tabulae, radial septa but no fossula, axial structure or dissepiments. Nelson (pers comm.) believes the family should be enlarged "so that it contains solitary tetracorals, usually trochoid, conoidal or ceratoid in shape but which may also include slightly angulate to trilobate coralla. Septa are numerous and may extend directly to the centre or may unite before reaching it and form a vermiform axial complex. A fossula may or may not be present. Tabulae are fairly abundant and may be continuous or discontinuous".

Genus Streptelasma Hall

Genotype: Streptoplasma expansa Hall, 1847

Streptelasma expansa Hall, 1847

Genolectotype: Streptelasma corniculum Hall, 1847 (fide Romer, 1861)

This genus has simple, conical coralla, with tetrameral symmetry. It has long primary septa and septal spines, with no true tabulae. Usually a fossula is present.

We are including a new species Streptelasma sp. (see page 67) in this genus. It has a palicolumella and is therefore not a true Streptelasma, but belongs to a new genus that will be described by Dr. S. J. Nelson (in press).

Streptelasma angulatum (Billings)

(Plate VI, figure 6)

1862 Petraia angulata Billings, Geol. Surv. Can., Pal. Foss., Vol. 1, p. 103, figs. 90a, b.

1866 Petraia angulata Billings, Geol. Surv. Can., Cat. Sil. Foss. Anticosti, p. 7.

1900 Streptelasma angulatum (Billings). Lambe, Geol. Surv. Can., Cont. Can. Palaeo., Vol. IV, pt. II, p. 112.

1928 Streptelasma angulatum (Billings). Twenhofel, Geol. Surv. Can., Mem. 154, p. 111, pl. 3, fig. 5.

1937 Streptelasma angulatum (Billings). Cox, Geol. Mag., Vol. 74, No. 1, p. 4, pl. 1, fig. 5.

1943 Streptelasma trilobatum (Whiteaves, partim). Okulitch, Trans. Roy. Soc. Can., Ser. III, Sec. IV, Vol. XXXVII, p. 61.

This species is characterized by a deep calyx of about 10 mm., and the acutely angulate shape on the convex side.

Our specimens are 28 mm. high. The width of the corallum is 15 mm. and its length is 20 mm. Due to poor preservation, we were unable to establish the distribution of the septa. The external form is sufficient to identify this species.

Hypotype: University of Alberta No. 34015

Locality: Redstone River (BM-94-2)

Horizon: Upper Ordovician

Unfigured plesiotypes: 34018, 34023 (BM-94-2); 31024 (Pe-6)

Streptelasma trilobatum (Whiteaves)

(Plate VI, figures 3, 4)

1895 Streptelasma rusticum var. trilobatum Whiteaves, Geol. Surv. Can., Pal. Foss., Vol. III, pt. II, p. 113.

1900 Streptelasma latusculum var. trilobatum (Whiteaves). Lambe, Geol. Surv. Can., Cont. Can. Palaeo., Vol. IV, pt. 2, p. 115.

1928 Streptelasma robustum var. amplum Troedsson, Medd. om Grønland, Vol. 72, p. 108, pl. 26, figs. 1-4.

1928 Streptelasma foerstei Troedsson, op. cit., p. 109, pl. 25, figs. 1, 3; pl. 26, fig. 5.

1937 Streptelasma trilobatum (Whiteaves). Cox, Geol. Mag., Vol. 74, No. 871, p. 13, pl. 2, figs. 5a-c (teste Nelson).

1943 Streptelasma trilobatum (Whiteaves, partim). Okulich, Trans. Roy. Soc. Can., Ser. III, Sec. IV, Vol. XXXVII, pl. 1, figs. 13, 14.

Although none of our specimens has preservation that enables a clear diagnosis of the species, the external trilobate appearance of the coral is sufficient to permit its identification. Nelson (pers. comm.) assigns little importance to the size of the corallum in speciation. Our specimens range from 25 mm. to 60 mm. in diameter.

S. trilobatum is diagnostic of the Stony Mountain and Stony Mountain equivalents.

Hypotypes: University of Alberta Nos. 31018 (Pe-6); 34205 (S-15A)

Locality: Ramparts River (Pe-6) and Blackwater Lake (S-15A)

Horizon: Upper Ordovician

Unfigured plesiotypes: 31069 (Cr-11-6); 34206 (K-43)

Streptelasma sp.

(Plate VI, figures 5a - 5c)

In press Nelson, Geol. Surv. Can., Ordovician Stratigraphy and Palaeontology, North Part of Hudson Bay Lowlands, Manitoba

This species is one to be described by Dr. S. J. Nelson in a forthcoming paper on the Hudson Bay lowlands, with a holotype G.S.C. No. 10898. In his description Nelson (pers. comm.) describes the species as follows: "a height of close to 50 mm. ... largest attains 80 mm. ... transverse ... diameters ... at the top of the calyx of 46 and 40 mm. ... The apex is strongly flattened approximately parallel to the plane of the alar septa, and usually has a well defined ... spoon shaped depression on the cardinal side ... a section ... taken near the base of the corallum ... had a crescent shaped outline. ... In mature ... stages the corallum has a nearly circular transverse outline. The transverse width of the trough shaped apex ... is about 15 mm. ... The calyx is deep and about half the height of the corallum, and is flat bottomed. A very prominent palicolumella in the plane of the cardinal-counter septa protrudes 5 to 10 mm. above the floor of the calyx. ... Septa are numerous ...".

Our specimens agree well with this description.

Homoeotype: University of Alberta No. 31024

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Unfigured plesiotypes: 34040 (BM-94-1B); 31039A (Pe-6); 34207 ? (K-107); 24208 (K-107); 31145 (Cr-11-6); 34228 (K-1B)

PHYLUM BRACHIOPODA

Class ARTICULATA

Order TELOTREMATA

Superfamily RHYNCHONELLACEA Gray

Genua Rhynchotrema Hall, 1860

Genotype: Rhynchotrema increbescens Hall, 1860

Wang (1949) revised the genus, and noted that R. increbescens Hall is the genotype and not R. capax (Conrad) as had formerly been thought. Many of the species of the old genus were re-assigned to a new genus Lepidocyclus which had deltidial plates as opposed to the revised genus Rhynchotrema which has an open delthyrium. He also stressed the sub-triangular to sub-pentagonal outline of the shell.

Rhynchotrema cf. R. capax (Conrad)

1842 Atrypa capax Conrad, Journ. Acad. Nat. Sci. Philadelphia, Vol. 8, p. 264, pl. 14, fig. 21 (teste Nelson).

1928 Rhynchotrema capax (Conrad). Troedsson, Medd. om Grønland, Vol. 72, No. 1, pt. 2, p. 94, pl. 23, figs. 6-8; pl. 25, figs. 6a,b.

The specimen that we are referring to R. capax is 26.4 mm. long, 26.7 mm. wide, and 20.5 mm. thick. It is unequally biconvex, the brachial valve being deeper (11 mm.) than the pedicle (9.5 mm.). The beaks are both curved with the pedicle beak being concealed by the brachial.

A strong sulcus in the pedicle valve is matched by a plica in the brachial valve. The sulcus is a maximum of 3 mm. deep,

and is 12.6 mm. wide at the anterior comissure (uniplicate).

There are 3 costae in the sulcus and 4 in the plica, with about 10 for each valve.

Deltidial plates were not observed in our specimens - thus the generic assignment is that of Rhynchotrema rather than that of Lepidocyclus as given by Shrock and Twenhofel (1953) (Wang, 1949, did not discuss capax in his revision of the genus).

This species is considered diagnostic of upper Ordovician in North America.

Hypotype: University of Alberta No. 31048

Locality: Ramparts River (Pe-6)

Horizon: Upper Ordovician

Unfigured plesiotypes: 31018 ? , 31024 (Pe-6); 34107 (WM-104A); 34033 (BM-94-1B); 34073 (BM-94-1B); 34001 ? (BM-94-1); 34106 (BM-94-1)

PLATE I

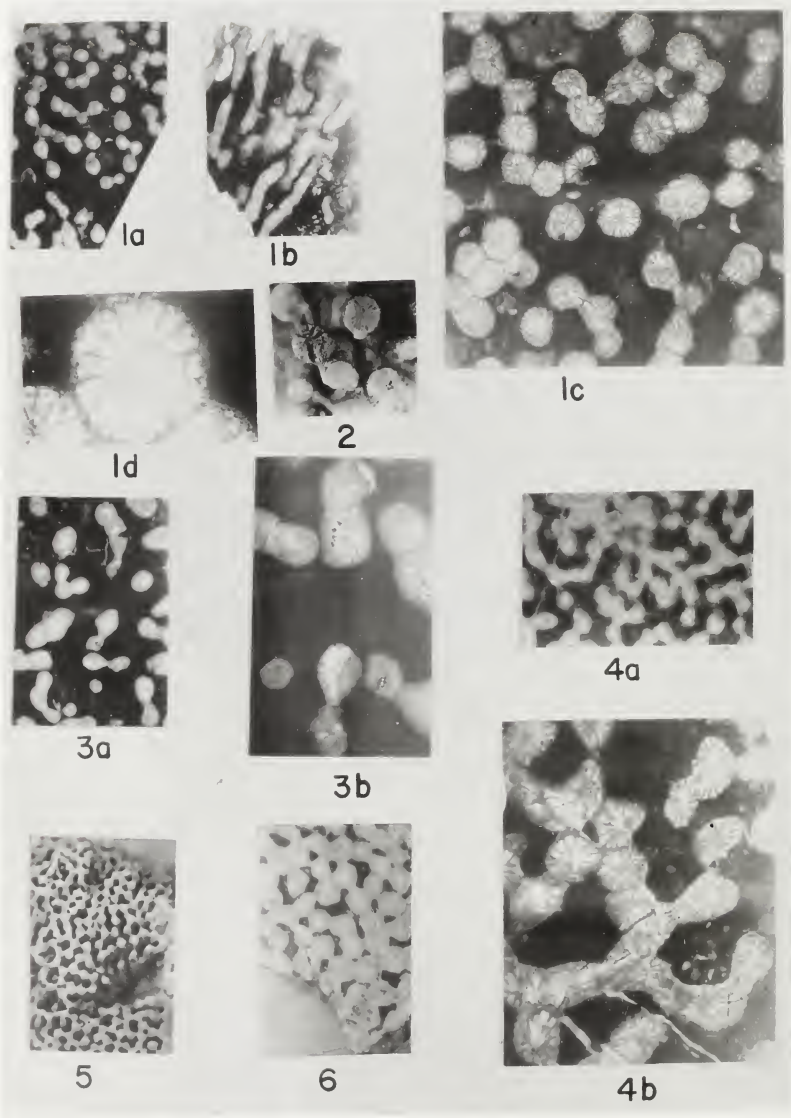


PLATE I

Palaeophyllum spp.

1a - 1d *Palaeophyllum vaurealensis* (Twenhofel) - hypotype 31076.

1a-1b (x 1) transverse and longitudinal sections of corallites.

1c (x 2.5) transverse section of corallites.

1d (x 10) transverse section of corallite showing septa and septal spines.

2 (x 1) *Palaeophyllum stokesi* (Edwards and Haime) - hypotype 31021. transverse section of corallites.

3a - 3b *Palaeophyllum halysitoides* (Wilson) - hypotype 31050.

3a (x 1) transverse section of corallite showing mode of growth.

3b (x 2.5) transverse section showing septa.

4a - 4b *Palaeophyllum 31065* nov. n. - hypotype 31065.

4a (x 1)
4b (x 2.5) transverse section of corallites showing halysitoid growth and septa.

5 (x 1) *Palaeophyllum parvum* Stearn - hypotype 31031. transverse section.

6 (x 1) *Palaeophyllum calicina* (Nicholson) - hypotype 34214. transverse section.

PLATE II

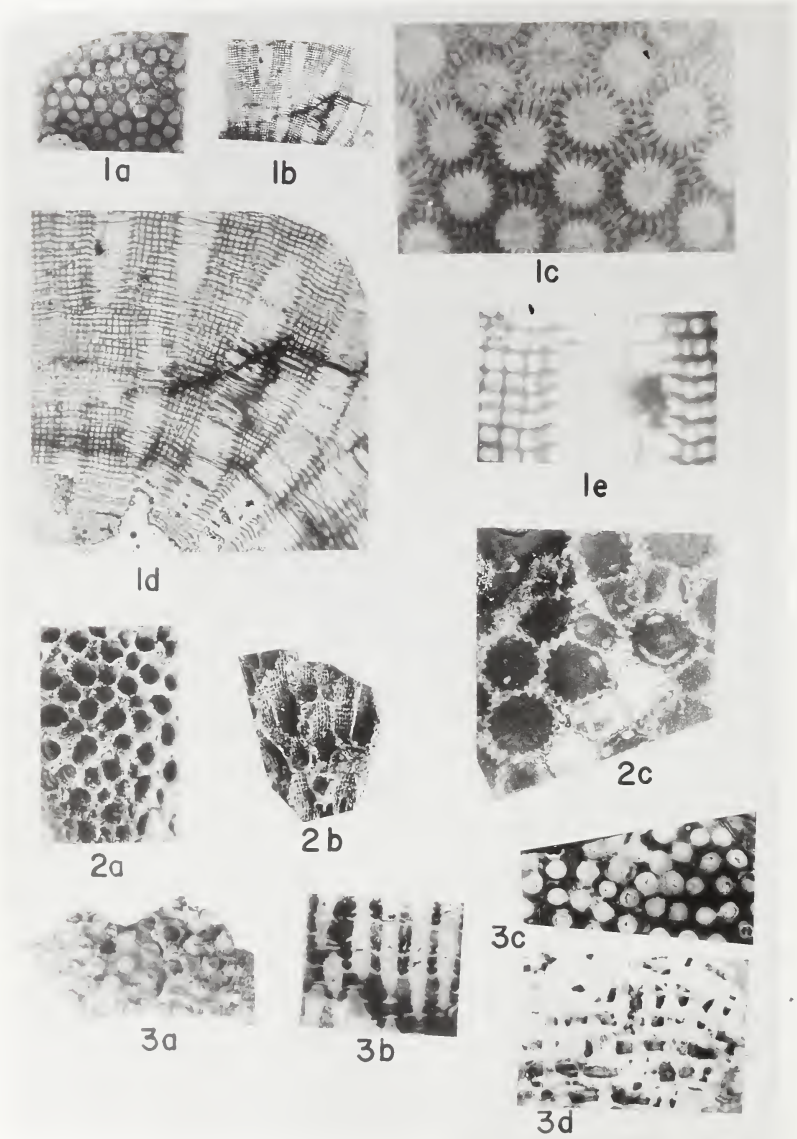


PLATE II

Calapoecia Billings, and *Sarcinula* Lamarck

1a - 1e *Calapoecia anticostiensis* Billings - hypotype 31044.

1a-1b (x 1) transverse and longitudinal sections.

1c (x 2.5) transverse section of corallites showing speichae.

1d (x 2.5) longitudinal section of corallites showing lattice-work formed by horizontal tavolae and vertical speichae. Note the weak tabulae in the corallite.

1e (x 7.8) transverse section of corallite (figure inverted) showing bending of tavolae prior to joining of tabulae.

2a - 2c *Calapoecia canadensis* Billings - hypotype 31543A.

2a-2b (x 1) view of top and side of corallum.

2c (x 2.5) transverse section showing corallites.

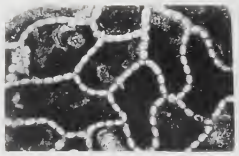
3a - 3d (x 1) *Sarcinula* 31029 nov. sp.

3a view of top of corallum of hypotype 31029.

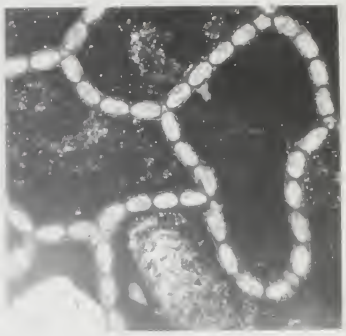
3b-3c longitudinal and transverse sections of paratype 34202.

3d longitudinal section of paratype 34154.

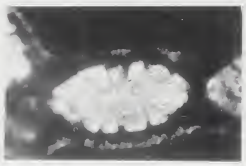
PLATE III



1a



1b



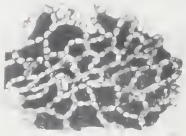
1c

1d

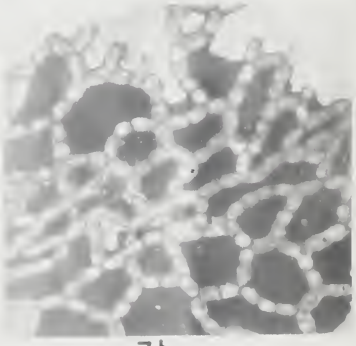
2b

2a

2c



3a



3b

PLATE III

Catenipora spp.

1a - 1d *Catenipora rubra* Sinclair and Bolton - hypotype 31564.

1a (x 1) transverse section showing lacunae.

1b (x 2.5) transverse section.

1c (x 10) transverse section of corallite showing septa.

1d (x 10) transverse section of corallite showing the epitheca (primary wall) light material, and theca (periperal stereozone) dark material.

2a - 2c *Catenipora rubra* var. 31525 var. nov.

2a (x 1) transverse section showing lacunae.

2b (x 2.5) transverse section.

2c (x 9) transverse section of corallite showing the epitheca (light material) and theca (dark material).

3a - 3b *Catenipora quebecensis* (Lambe)

3a (x 1) transverse section showing lacunae.

3b (x 2.5) transverse section showing corallites and lacunae.

PLATE IV

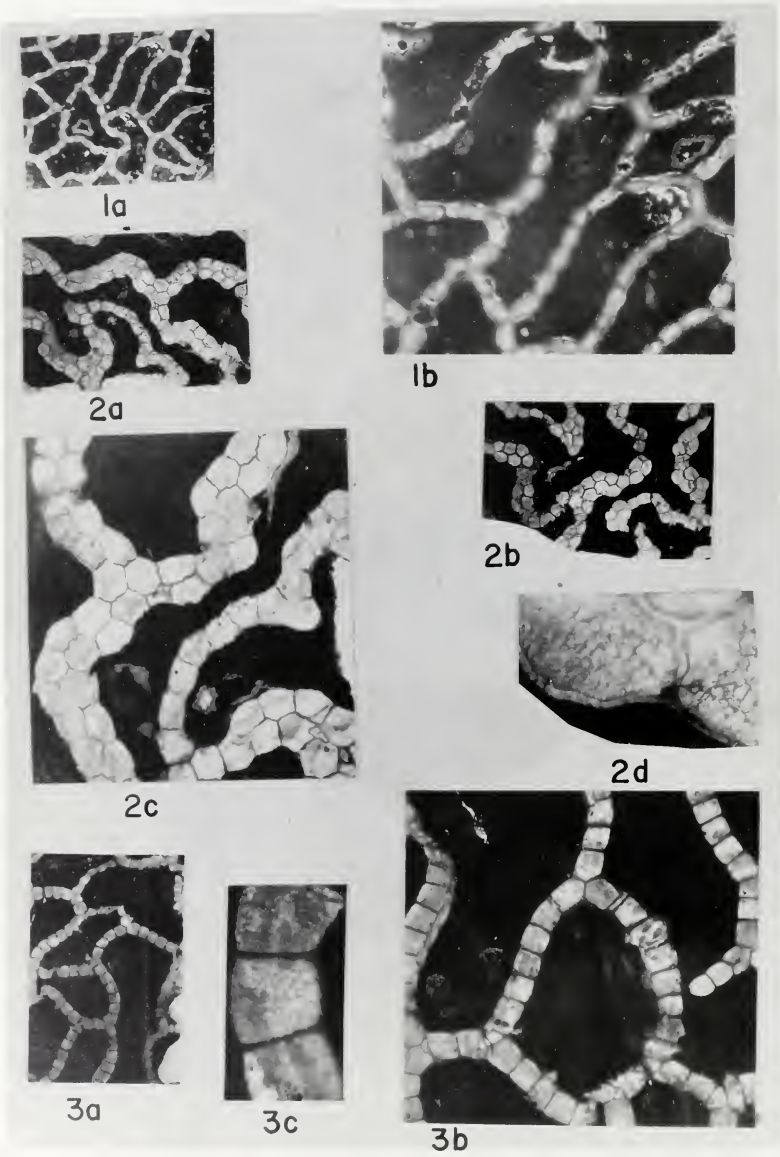


PLATE IV

Catenipora sp., *Manipora* spp.

1a - 1b *Catenipora agglomeratiformis* (Whitfield) - hypotype 33738.

1a (x 1) transverse section showing lacunae.

1b (x 2.5) transverse section showing corallites and ranks.

2a - 2d *Manipora amicarum* Sinclair - hypotypes 31560, 31546.

2a (x 1) transverse section of hypotype 31560 showing lacunae.

2b (x 1) transverse section of hypotype 31546 showing lacunae.

2c (x 2.5) transverse section of hypotype 31560 showing corallites.

2d (x 10) transverse section of corallite showing epithecal wall but no theca.

3a - 3c *Manipora 31545* sp. nov. - holotype 31545.

3a (x 1) transverse section showing lacunae.

3b (x 2.5) transverse section showing corallites.

3c (x 10) transverse section of corallite showing simple epithecal wall.

PLATE V

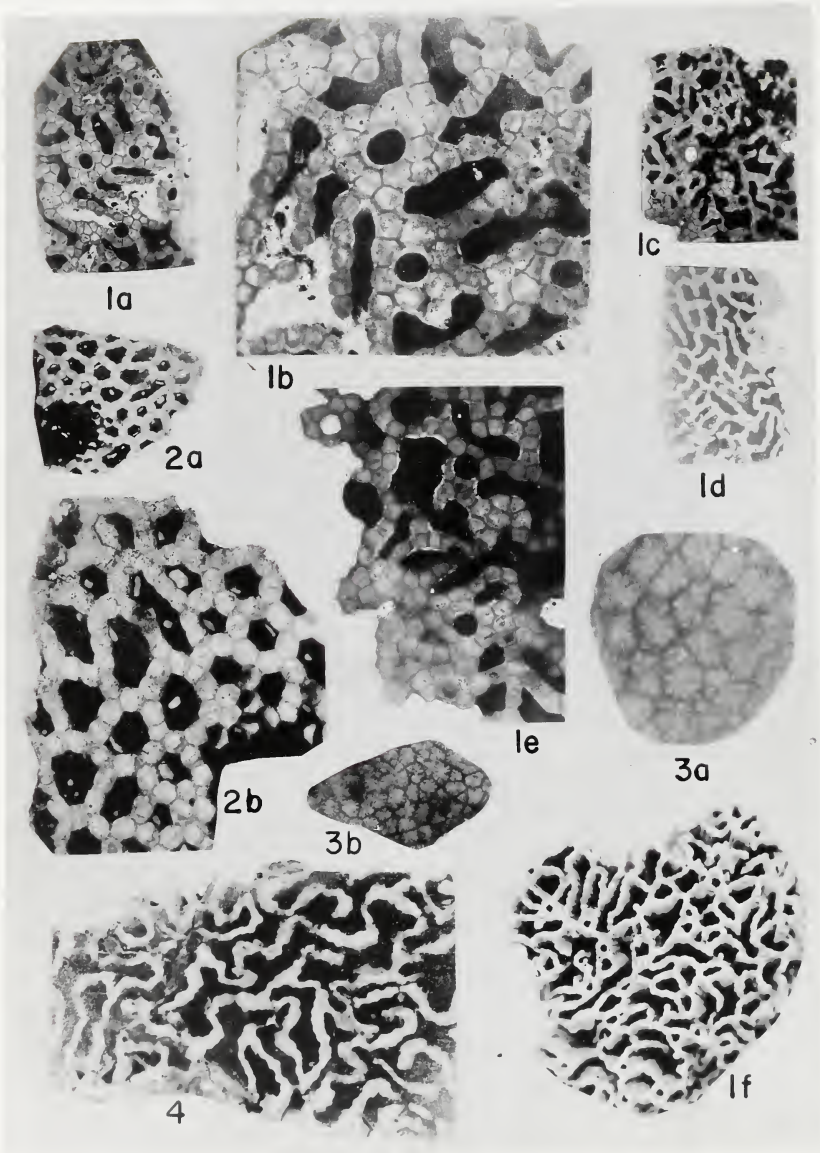


PLATE V

Manipora spp. and *Foerstephyllum* sp.

1a - 1b *Manipora* 31033 sp. nov. - holotype 31033.

1a (x 1) transverse section showing circular and varishaped lacunae.

1b (x 2.5) transverse section showing corallites.

1c (x 1) *Manipora* 31033 var. A var. nov. - holotype 31015.

transverse section showing circular and varishaped lacunae.

1d (x 1) *Manipora* 31033 var. A var. nov.

transverse section of specimen 31056 showing one small circular lacunae, and varishaped lacunae.

1e (x 2.5) *Manipora* 31033 var. A var. nov.

transverse section of holotype 31015 showing corallites.

1f (x 0.66) *Manipora* 31033 sp. nov.

view of corallum of paratype 31006.

2a - 2b *Manipora* 34072 sp. nov. - holotype 34072.

2a (x 1) transverse section showing lacunae.

2b (x 2.5) transverse section showing corallite.

3a - 3b *Foerstephyllum* sp. - hypotype 34076.

3a (x 2.5) transverse section showing corallites and septa.

3b (x 1) transverse section showing corallites.

4 (x 0.6) *Manipora amicarum* Sinclair - hypotype 31546.

polished section of corallum of hypotype.

PLATE VI

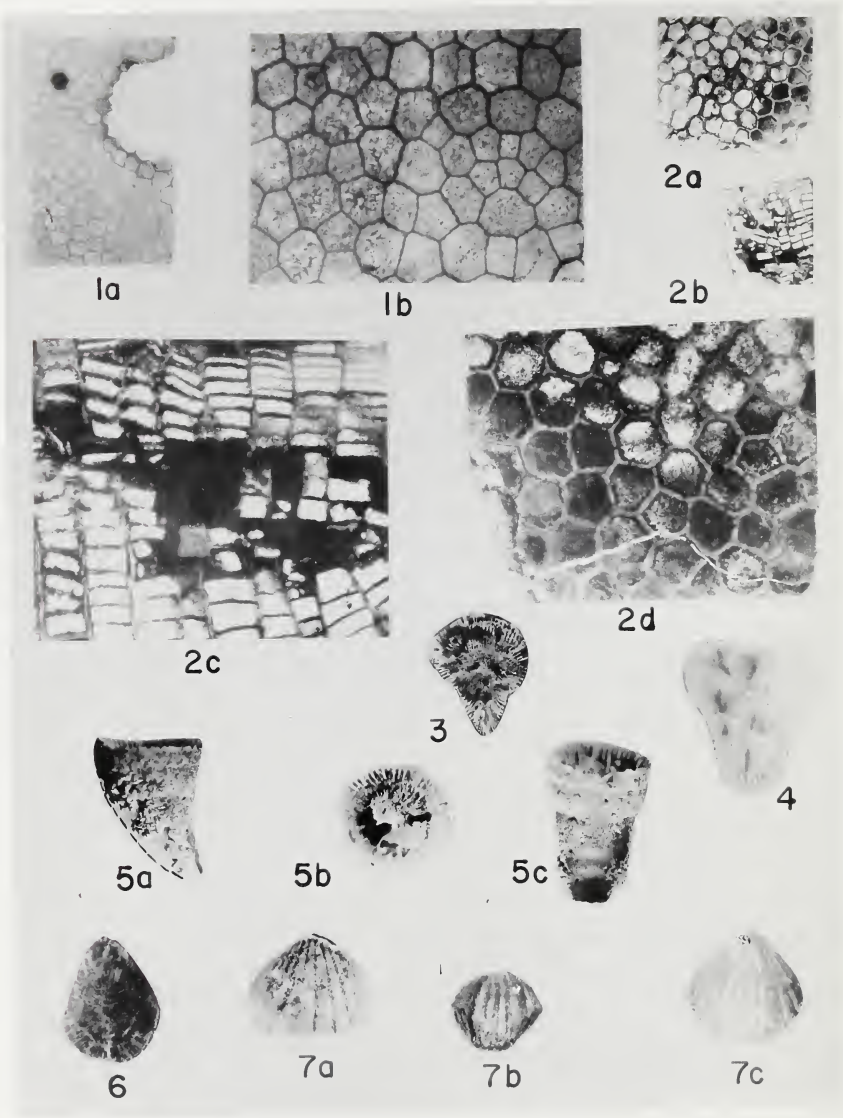


PLATE VI

Paleofavosites, Streptelasma and Rhynchotrema

1a - 1b *Paleofavosites capax* (Billings) - hypotype 31047.

1a (x 1) transverse section.

1b (x 2.5) transverse section.

2a - 2d *Paleofavosites okulitchi* Stearn - hypotype 31068.

2a (x 1) transverse section showing corallites.

2b (x 1) longitudinal section.

2c (x 2.5) longitudinal section.

2d (x 2.5) transverse section showing mural pores.

3 (x 0.5) *Streptelasma trilobatum* Whiteaves - hypotype 34205.

polished transverse section of corallum.

4 (x 0.85) *Streptelasma trilobatum* Whiteaves - hypotype 31018.

polished transverse section of corallum.

5a - 5c *Streptelasma* sp. - homoeotype 31024.

5a (x 0.5) side view of corallum.

5b (x 0.5) view of top of corallum.

5c (x 0.5) front view of corallum showing spoon shaped depression on the cardinal side.

6 (x 1) *Streptelasma angulatum* - hypotype 34015.

transverse section of corallum

7a - 7 c *Rhynchotrema* cf. *R. capax* (Conrad) - hypotype 31048.

7a (x 0.85) view of pedicle valve.

7b (x 0.56) view of anterior comissure.

7c (x 0.85) view of brachial valve.

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APPENDIX I

Index To Fossil Localities
(See fig. 2)

MACKENZIE MOUNTAINS

Ramparts River (Pe-6) Faunule

Palaeophyllum halysitoides (Wilson)

P. parvum Stearn

P. stokesi (Edwards and Haime)

P. vaurealensis (Twenhofel)

P. 31065 nov. n.

Calapoecia anticostiensis Billings

Sarcinula 31029 nov. sp.

Paleofavosites capax (Billings)

P. okulitchi Stearn

P. prolificus (Billings)

Catenipora agglomeratiformis (Whitfield)

C. quebecensis (Lambe)

C. rubra Sinclair and Bolton

Manipora 31033 nov. sp.

M. 31033 var. *A* nov. var.

Streptelasma angulatum (Billings)

Streptelasma trilobatum (Whiteaves)

Streptelasma sp.

Rhynchotrema cf. *R. capax* (Conrad)

Kochoceras sp. (identified by Dr. S. J. Nelson)

Manipora amicarum Sinclair

Ted Creek (Cr-11-27) Faunule

Calapoecia anticostiensis Billings

C. canadensis Billings

Paleofavosites prolificus (Billings)

Catenipora agglomeratiformis (Whitfield)

C. rubra var. *31525* nov. var.

C. rubra Sinclair and Bolton

Manipora amicarum Sinclair

M. 31545 nov. sp.

Cranswick River (Cr-11-6) Faunule

Palaeophyllum halysitoides (Wilson)

P. parvum Stearn

Catenipora rubra Sinclair and Bolton

Streptelasma trilobatum (Whiteaves)

Streptelasma sp.

Hume River (MF-2) Faunule

Calapoecia anticostiensis Billings

Catenipora agglomeratiformis (Whitfield)

Hume River (BM-109) Faunule

Palaeophyllum stokesi (Edwards and Haime)

Sarcinula 31029 nov. sp.

Manipora amicarum ? Sinclair

Mountain River (BM-103) Faunule

Catenipora rubra Sinclair and Bolton

Imperial River Canyon (K-98) Faunule

Paleofavosites capax (Billings)

Catenipora quebecensis (Lambe)

C. rubra Sinclair and Bolton

Imperial River Canyon (BM-99) Faunule

Palaeophyllum vaurealensis ? (Twenhofel)

Carcajou Lake (K-78B) Faunule

Foerstephyllum ? sp.

Holophragma anticonvexa Okulitch

Rouge Mountain (BM-89) Faunule

Catenipora agglomeratiformis (Whitfield)

Redstone River (BM-94) Faunule

Lot 1

Catenipora agglomeratiformis Whitfield

Rhynchotrema cf. R. capax (Conrad)

Lot 2

Streptelasma angulatum (Billings)

Lot 1A

Paleofavosites prolificus (Billings)

Paleofavosites sp.

Lot 1B

Paleofavosites capax (Billings)

Paleofavosites sp.

Manipora 34072 nov. sp.

Streptelasma sp.

Rhynchotrema cf. *R. capax* (Conrad)

Foerstephyllum ? sp.

Lot 1C

Palaeophyllum parvum Stearn

FRANKLIN MOUNTAINS

Lac a' Jacques (S-44B, S-44T) Faunule

Palaeophyllum vaurealensis (Twenhofel)

Gibson Range (K-107) Faunule

Palaeophyllum halysitoides (Wilson)

Palaeophyllum cf. *P. vaurealensis* (Twenhofel)

Palaeophyllum 31065 nov. sp.

Paleofavosites capax (Billings)

Manipora 31033 var. *A* nov. var.

Streptelasma sp.

Mount St. Charles (Martin Lake) (K-36) Faunule

Palaeophyllum calicina (Nicholson)

Palaeophyllum parvum Stearn

Manipora 31033 var. *A.* nov. var.

Mount St. Charles (WM-103) Faunule

Catenipora rubra Sinclair and Bolton

Mount St. Charles (S-22C) Faunule

Catenipora agglomeratiformis (Whitfield)

Lake North of Mount Clark (K-37) Faunule

Palaeophyllum parvum Stearn

Blackwater Lake (S-15B) Faunule

Catenipora rubra Sinclair and Bolton

Palaeophyllum parvum Stearn

Sarcinula 31029 nov. sp.

Blackwater Lake (S-15A) Faunule

Streptelasma trilobatum (Whiteaves)

Palaeophyllum cf. *P. halysitoides* (Wilson)

Blackwater Lake (K-21) Faunule

Palaeophyllum calicina (Nicholson)

Mount Kindle (BM-82) Faunule

Palaeophyllum halysitoides (Wilson)

Catenipora quebecensis (Lambe)

Mount Kindle (BM-83) Faunule

Catenipora quebecensis (Lambe)

Manipora 31033 var. *A* nov. var.

MACKENZIE MOUNTAINS (cont.)

Upper Redstone River (WM-104) Faunule

Rhynchotrema cf. *R. capax* (Conrad)

B29773